

The  
Logical  
Connection™

**Version 3.0**  
**User's Instruction Manual**

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# **PART I**

## **Introduction**

# Notes:

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# Chapter 1

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## How to Use This Manual

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In this chapter, you will learn

- How this manual is organized.
- Where to start.
- Where to find specific answers to questions.

### Introduction

Thank you for purchasing **The Logical Connection!** Once you have set it up to meet your needs, you will never again have to unplug another cable, search for the right adapter or worry about protocols, baud rates, parallel/serial conversion and all the other "details" that can make sharing many devices a big headache.

Plus, you'll be able to communicate with other **Logical Connection** boxes in other locations over a single twisted-pair wire – and share *their* devices, too!

Because **The Logical Connection** is so versatile – and so different from any other switching or printer sharing device – setting it up properly will take some concentrated time and attention on your part.

You will find everything you need to know in this manual. Be prepared to skip around a bit, however, because you will probably have to refer to different sections at different times, depending on your particular application, the equipment you are using and the extent of your own familiarity with the basics of peripheral interfacing.

# How this manual is organized

This manual is divided into four **PARTS**, as follows:

**PART I      Introduction**

Chapters 1 through 3 contain basic information about **The Logical Connection**. They should be read by everyone, novice or expert.

**PART II     For IBM-PC and Compatible Systems**

Your Utility Program Disk contains special programs that make it very easy to set up and use **The Logical Connection** with IBM-PC or compatible computers. Chapters 4 through 7 take you step by step through this entire process, from the simple installation of "preset" configurations to advanced applications like networking and modem multiplexing.

**PART III    For Non-IBM Compatible Systems**

If you do not have access to an IBM-PC or compatible computer, Chapters 8 through 11 explain how to set up and use your **Logical Connection** *without* the PC Utility Programs, on any computer or terminal that has an RS-232 serial port.

**PART IV     Reference Section**

Appendices A through H provide a complete set of quick reference materials that will be helpful to the novice in getting specific answers to questions, and to the expert in providing a place to look for technical specifications or more concise information.

This organization reflects the fact that setting up and using **The Logical Connection** is very different for IBM-compatible PC users than it is for users of other computers or terminals. It is much easier on a PC.

For this reason, most users will need to read either **PART II or PART III**, but not both.

# Where to start

You have already started at the right place – the beginning!

*All* users, expert and novice alike, should read these first three chapters (**PART I**) *first*, preferably before even unpacking **The Logical Connection**. They will give you a good overview of:

- How **The Logical Connection** works.
- What you can expect it to do for you.
- How to set it up for your particular application.

## IBM compatible systems

If you are setting up **The Logical Connection** with an IBM compatible PC, you should turn to Chapter 4, "A Quick Start," after reading **PART I**.

**Novice users will be happy to discover that for many applications, Chapter 4 contains everything you need to know to get "up and running" with one of the special "preset" configurations that have already been provided for you.**

More experienced users or those with advanced needs may wish to read quickly through this chapter and move on to the remainder of **PART II** for complete instructions on:

- Setting up custom configurations.
- Saving configurations to files.
- Instant switching with the memory resident **POPLC** program.
- Multi-box configurations.
- Configurations using modems.

## Non-IBM compatible systems

Since **The Logical Connection** is so much easier to set up on an IBM compatible PC, we strongly recommend that you use a PC for the configuration process, even if you will be setting it up to *use* with other kinds of computers or terminals.

If it is not possible to use an IBM-PC or compatible, you can still configure **The Logical Connection** – but you will have a little more work to do. Chapters 8 through 12 (**PART III**) will guide you step by step through **The Logical Connection's** *internal* configuration program. This process is a bit more cumbersome, but you can do it without special software on any “dumb” terminal or any computer with a serial port and a terminal emulation program.

## Combination systems

If you are going to configure **The Logical Connection** on an IBM-PC compatible, but *use* it with another kind of computer – or if you will be connecting both compatible *and* non-compatible computers to it – read Chapters 4 through 7 (**PART II**) *first*. Then turn to **PART III** and read Chapter 12 to learn how to *switch* connections (by sending “selection strings”) from a non-compatible computer.

## Where to find specific information

Every attempt has been made to arrange this manual in a clear and logical order. Most of the time you will be able to find the answer to any specific question simply by scanning the table of contents for the appropriate section.

When this is not successful, the **INDEX** (Appendix I) will probably point you in the right direction. A **GLOSSARY** (Appendix H) is also included in **PART IV**, which lists and defines most of the terms used frequently in this manual.

In addition, the following appendices in **PART IV** serve as handy references for specific kinds of information:

A. **All about cables.**

Technical information about parallel and serial cables, port configurations, connectors, making your own cables, sources for commonly needed cables.

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B. **List of preset configurations.**

Screen diagrams and specifications for each of the eight "preset" configurations supplied with **The Logical Connection** on the Utility Programs Disk. These are a good source of ideas and sample applications to guide you in the setup process even if none of them meets your needs precisely (or if you are not using an IBM compatible PC).

C. **RUN and STATUS indicators.**

A complete listing and explanation of all functions of the **RUN** and **STATUS** LED indicators during setup, normal operation and network ("daisy-chained") mode, as well as various error conditions.

D. **Preventing radio & television interference.**

E. **Troubleshooting The Logical Connection**

F. **Technical support.**

G. **Warranty information.**

## Typographic conventions

1. **TEXT**

Normal explanatory text will be in straight 10-point type. *Italics* and **bold** type will be used where appropriate for emphasis.

2. **BOXES**

Special instructions or critical points will be printed in **bold** type and separated from the rest of the text by enclosing them in a box. You should pay particular attention to any information that appears in boxes.

3. **COMMANDS AND PROMPTS**

Commands or other text that you must enter on your PC or terminal keyboard will be indented and set in typewriter face, like this:

CD \LC 

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#### 4. VARIABLES

Variable strings that you must enter will be indicated with **italics**, such as:

**POPLC LC=port number** 

#### 5. KEY SYMBOLS

Special keyboard keys will be indicated by the following diagrams:

<b>&lt;ENTER&gt; or &lt;RETURN&gt;</b>	
<b>&lt;ESCAPE&gt;</b>	
<b>&lt;CONTROL&gt;</b>	
<b>&lt;ALT&gt;</b>	
<b>&lt;BACKSPACE&gt;</b>	
<b>&lt;INSERT&gt;</b>	
<b>&lt;DELETE&gt;</b>	
<b>&lt;HOME&gt;</b>	
<b>&lt;END&gt;</b>	
<b>FUNCTION KEYS</b>	 ,  , etc.
<b>CURSOR KEYS</b>	   

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# Chapter 2

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## What is The Logical Connection?

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In this chapter, you will learn about:

- The Logical Connection's features and functions.
- How it is used.
- The accessories that came with it, including the power transformer & cord, the red PC serial cable, and the Logical Connection Utility Program Disk.

### What is it?

Although it looks simple on the outside, **The Logical Connection** is actually a very sophisticated computer with 256K or 512K of memory (depending on the model you have purchased).

Unlike a PC or other computer you may be familiar with, however, **The Logical Connection** is *dedicated* to the special purpose of receiving, storing, converting and transmitting streams of data, according to your instructions.

Instead of connecting computers, printers and other devices directly to each other, you plug them all into **The Logical Connection**, which transfers data between devices according to your instructions.

The process of setting up **The Logical Connection** to follow your "instructions" is called "configuring" it, and we'll have a lot to say about configuration throughout this manual.

# Applications

Because the data streams going through **The Logical Connection** are under control of a computer – and *you* control the computer – even the most complicated switching, sharing and data communications problems can be easily accomplished.

## Printer sharing

Printers, plotters and other peripherals can be freely shared among many computers. Each computer can print documents just as if it were directly connected to each printer. If several computers want to use the same printer at the same time, **The Logical Connection** will spool all the documents in its big buffer, then print them out in sequence.

It doesn't matter whether your computers and printers have serial or parallel interfaces – or both. **The Logical Connection** can send data from serial to serial, serial to parallel, parallel to serial, and parallel to parallel, in any combination.

## Instant switching

Computers can easily switch connections from one peripheral device to another, without even flipping a switch! Just “pop up” the memory-resident **POPLC** switching program on your PC screen and use the arrow keys to highlight the printer, plotter or modem you want to switch to – even if you're in the middle of another program!

On non-IBM compatible computers, you can choose your output destination just by sending a short “selection string” (an 8-character code which you define) to **The Logical Connection**.

## Multi-user connections

Up to 45 **Logical Connection** boxes can be wired together with a single two-conductor (“twisted-pair”) cable, up to 4,000 feet apart. That means you can connect all your equipment together . . . even if it is scattered around the building in different rooms.

Many users can share a common pool of peripherals, all at the same time! With a simple communications program, users can share files, data and send “electronic mail” to one another without the high cost of a LAN or add-on expansion cards.

## Modems

With a pair of **Logical Connections** and a pair of modems, you can even let a cluster of devices at one location talk to another cluster of devices across the country, all at the same time – over a single telephone line.

You will find additional ideas and concrete examples of how **The Logical Connection** can be used in later sections of this manual.

## What you get

When you open your **Logical Connection** box, you will find the following items:

- The Logical Connection
- Power Supply and cord
- Manual
- Red PC Serial cable
- Utility Program Disk

## The Logical Connection

The most important part of the package is – of course – **The Logical Connection** itself. From the outside, it is a surprisingly simple and compact metal box with eight port connectors, two LED indicator lights, and a pushbutton **RESET** switch.

## Serial ports

The ports labeled SERIAL #0 through SERIAL #3, starting at the left side of **The Logical Connection**, are set up exactly the same way as an IBM-PC's serial ports. This means that you can take any printer, modem or other device that will plug into a PC's serial port (COM1 or COM2), and plug it directly into **The Logical Connection**.

The SERIAL #0 port also has some special uses which will be discussed later.

## Parallel ports

The remaining ports are labeled PARALLEL OUT #4, PARALLEL OUT #5, PARALLEL IN #4 and PARALLEL IN #5. They are also set up using the same connectors as an IBM-PC (called "DB-25" connectors), so that any device that plugs into a PC's parallel port (LPT1 or LPT2) will also plug directly into **The Logical Connection**.

Parallel connections are always **one-way**, so you will find both IN and OUT connectors. The PARALLEL OUT connectors – like the ones on a PC – are "female" DB-25 connectors, which means that they have 25 sockets.

The PARALLEL IN connectors are "male" DB-25's, which means that *they* have 25 pins that will fit into the sockets of another female connector.

You should plug a parallel printer into one of the PARALLEL OUT ports, since data will be going OUT from **The Logical Connection** to the printer.

You should plug your PC's LPT1 port into one of the PARALLEL IN ports, since you will be sending data IN to **The Logical Connection** from your computer.

## RUN and STATUS indicators

The two red LED's (Light Emitting Diodes) are used to indicate various functions of **The Logical Connection**. During normal single-box operation:

1. The RUN indicator lights up and remains ON. It will begin to FLASH as an indication that the buffer is full.
2. The STATUS indicator will normally be OFF. It will FLASH for about half a second every time **The Logical Connection** receives a "selection string" (switching command).

These LED's are also used to indicate some advanced functions, error

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conditions and "network" operations. For a complete description of these functions, refer to **Appendix C**.

## **Power transformer & cord**

The power transformer takes 120 Volt current and changes it to 16 Volt current to power **The Logical Connection**. It plugs into a regular electrical wall outlet. The small 3-hole plug on the other end of the cord fits into the 3-prong connector recessed into the left end of **The Logical Connection**.

## **PC Serial cable**

This special red cable, with female **DB-25** connectors on each end, is used to connect your compatible PC to **The Logical Connection**. One end plugs into the PC's **COM1** serial port, the other into **The Logical Connection's** **SERIAL #0** port.

If you are using a non-compatible computer or terminal, this may still be the right cable to use, depending on how your serial ports are set up (consult Chapters 6, 10 and **Appendix A** for more information about cables).

## **Utility Program Disk**

This floppy disk contains two special programs:

**LCSETUP** An easy to use setup program to help you get **The Logical Connection** configured to your equipment and the kinds of switching and sharing you want to do.

**POPLC** A memory-resident "Pop-Up" program that lets you instantly switch connections from one peripheral to another.

It also contains other files and the ten "preset configurations" that are already set up for your use.

To use the programs on this disk you must have an IBM-PC, XT, AT or compatible computer (one that uses MS-DOS or PC-DOS version 2.0 or higher).



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## Chapter 3

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# What You Need to Get Started

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In this chapter, you will learn:

- The three steps in the configuration process.
- The difference between configuration on a PC compatible and a non-compatible computer or terminal.
- What equipment, cables and information you will need on hand to successfully complete your setup.

## Configuring The Logical Connection

There are three steps involved in setting up **The Logical Connection** to meet your particular needs:

1. Define the physical connections you will be making to each port, so **The Logical Connection** will know how each computer, printer or other device expects to be "talked" to.
2. Define the "logical" connections you want to make among all your devices – how you want to be able to switch and share them.
3. Get the right cables and plug your devices into **The Logical Connection**.

That's all there is to it (except for more advanced applications like "daisy-chaining" or modem multiplexing, which will be discussed later).

Each of these three steps will be covered in great detail, beginning with the next chapter.

# IBM compatible or non-compatible?

If you are using anything other than an IBM-PC or compatible to set up **The Logical Connection**, steps 1 and 2 will be very different for you – and a bit more complicated – than for PC users. The main differences are:

- If you don't have a PC, you will need a "dumb" terminal to configure **The Logical Connection**, using its *internal* configuration program. Another kind of computer with a serial port and a "terminal emulator" program will also work.
- The *internal* configuration program, due to space limitations in **The Logical Connection's** Read Only Memory (ROM), is more tedious to use than the disk-supplied version, and provides no on-line help.
- You may need a special cable to connect your computer or terminal to **The Logical Connection** if you can't use the red PC Serial Cable we supply. To determine this, you will have to consult the serial port "pin out" diagrams in Chapter 10 and your computer's manual.

There is also a difference in *using* **The Logical Connection** after it is configured, since you will have to send your switching commands ("selection strings") manually, by inserting them into a document or with the "printer control string" utility found in some application programs.

## What you need

Remembering these differences, here is what you will need to complete your first **Logical Connection** setup on a PC:

- An IBM-PC or compatible computer equipped with at least one serial port.
- The red PC Serial Cable supplied with this package, to connect your PC's serial port to **The Logical Connection's** SERIAL #0 port.

- The proper cables to connect each of your devices to **The Logical Connection**. These are the same cables you would need to connect the same devices to an IBM-PC. If your devices are presently connected to PC's you already have the right cables.
- The instruction manuals for each device you want to hook up to **The Logical Connection**. This is where you will get the necessary information about parity, baud rate, word length and so on, for each of your devices.
- A blank "Configuration Assignment Form" (supplied with this manual), on which to plan and make a physical record of your configuration.

**BEFORE YOU BEGIN THE SETUP PROCEDURE**, follow along step-by-step in the next chapter (or **PART III**, if you are not using a PC) as we walk through the complete setup process. If possible, try out one of the preset configurations first, before trying one of your own. When you have a clear understanding of what you will have to know and do, sit down and fill out the "Configuration Assignment Form" included in this package. That way you will be able to plan your setup in advance, and have all the answers right in front of you for the questions you will be asked in the configuration program.



## **PART II**

**For IBM-PC and  
Compatible Systems**

# **Notes:**

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# Chapter 4

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## A Quick Start

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In this chapter you will learn how to get "up and running" as quickly as possible with a preset configuration. This includes:

- Connecting your PC to The Logical Connection.
- Installing the utility programs on your hard disk or using them from a floppy diskette.
- Selecting a preset configuration and downloading it to The Logical Connection.
- Connecting your printers & other peripherals to The Logical Connection.
- Switching connections with the POPLC program.

### For PC users

If you are an IBM-PC (or compatible) user with average needs, you will probably find everything you need to get started right here.

The Logical Connection was designed with PC users in mind. While it can be used with practically *any* computer, there are several features that make it easier to set up and use on an IBM-PC or compatible:

- You can use the LCSETUP program on the Utility Program Disk to configure The Logical Connection very quickly and easily.
- You can use the special red PC Serial Cable provided to connect your PC to The Logical Connection.

- The Logical Connection's serial and parallel ports are set up just like the ones on an IBM-PC. Any printer or peripheral you presently have connected to a PC, can be plugged directly into The Logical Connection *using the same cable*.
- You can instantly switch connections from one printer to another, without leaving any program you may be using, with the unique POPLC switching program on the Utility Program Disk.

All these advantages will become clearer as you move further along in this chapter. For now, let's get started.

## Installing the utility programs

If your PC is equipped with a hard disk, begin by installing the Logical Connection's utility programs on it. Follow these steps:

1. Create a new directory named LC to contain your programs, and switch to the new directory by typing (at the DOS prompt):

```
CD \ [←]
MD LC [←]
CD LC [←]
```

2. Put The Logical Connection Utility Program Disk into your PC's A: drive.
3. At the DOS prompt, type

```
COPY A:*.* [←]
```

You will see a list of files displayed on the screen, followed by the message

**N files copied**

and a return to the DOS prompt. At this point you should remove the Utility Program Disk and store it in a safe place.

You may also wish to make a backup copy of the diskette for safekeeping. For information on how to copy a diskette (using the "DISKCOPY" command), consult your DOS manual.

If you do *not* have a hard disk you *must* make at least one "working copy" to use in the configuration process. This working copy must not have a write-protect tab, since the LCSETUP program will need to write the configuration information you enter on the disk. After you make your working copy, put the original diskette away for safekeeping.

Before using the Utility Programs, check to see if there is a file named **README.TXT** among them. If so, print out the file and read it; any changes or additions to the programs that may have been made after this manual will be explained in this file.

## The first connection

The first connection you have to make is between **The Logical Connection** and your PC's COM1 or COM2 serial port, using the red PC Serial Cable.

You **MUST** have a serial port (COM1 or COM2) to configure **The Logical Connection**. Not all PC's have serial ports. If yours does not, you will need to purchase one or borrow a PC that has one. **AFTER** the configuration process, you can connect your PC to **The Logical Connection** through your parallel printer port if you wish.

### The PC serial cable

Plug one end of the red PC Serial Cable into **The Logical Connection's** SERIAL #0 port. Plug the other end into your PC's COM1 or COM2 serial port. Since both ends of the cable are just alike, you won't have any trouble figuring out which end goes where.

If you have an IBM-AT or compatible with a *9-pin* serial connector, you will need to use the 9-pin to 25-pin converter that probably came with your computer.

Before beginning the setup process, you should use the DOS "MODE" command to set your serial port to 9600 baud, no parity, 8 data bits and 1 stop bit. For more information on the MODE command, consult your DOS manual. If you are using the COM1 serial port, you should type (at the DOS prompt):

**MODE COM1:9600,N,8,1** 

**NOTE - You must NOT set the optional "P" flag for your serial ports when using the MODE command. This may interfere with proper operation of The Logical Connection in some circumstances (especially during configuration).**

If you will be connecting your PC to **The Logical Connection** for regular operation (*after* this setup process), you will also want to use the MODE command to re-direct your printer output through your serial port (parallel is standard). This will be discussed later.

## **The power transformer**

The next step is to insert the small 3-hole plug (at the end of the power transformer cord) into the recessed 3-prong socket on the left edge of **The Logical Connection**. Then, "power up" by plugging the transformer into a regular 120 V electrical outlet.

The RUN LED will begin flashing, and the STATUS LED will come ON. After about 20 seconds, the RUN LED will stop flashing and remain ON; the STATUS LED will go OFF. If the LED's do something else, press the RESET button on the left edge of **The Logical Connection**.

## **Preset configurations**

The quickest way to get started using **The Logical Connection** is to select one of the ten **preset configurations** that are provided for you. Unless you have some unusual requirements, it is likely that one of these configurations will meet your needs without modification.

This is actually the easiest approach even if *none* of the presets can be used "as is." If you start with a preset that is close to your needs and modify it as necessary, you will still have an easier job than starting from scratch.

For the purposes of this chapter, however, we will assume that no modification is needed.

## The LCSETUP program

To see these preset configuration and select one of them, you will need to run the LCSETUP program.

If your Logical Connection utility programs have been installed on your hard disk, type:

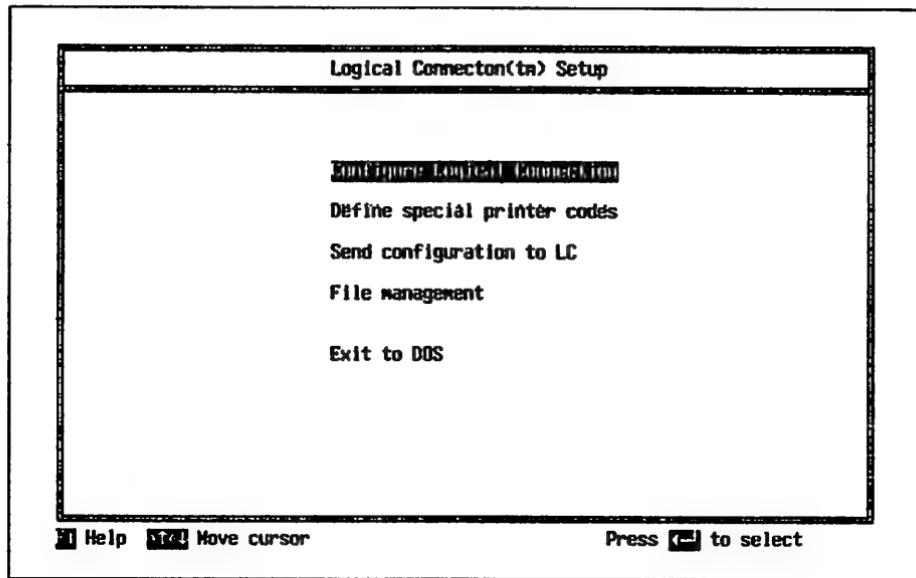
CD \LC   
LCSETUP

If The Logical Connection is connected to your PC's COM2 port, you must add the optional *PC=COM2* to the line. The default connection if you do not specify this option is COM1.

If you are operating from a floppy diskette, insert your *non write-protected* copy of Utility Program Disk in your PC's A: drive and type:

A:   
LCSETUP

After you press , the LCSETUP program's Main Menu will appear.



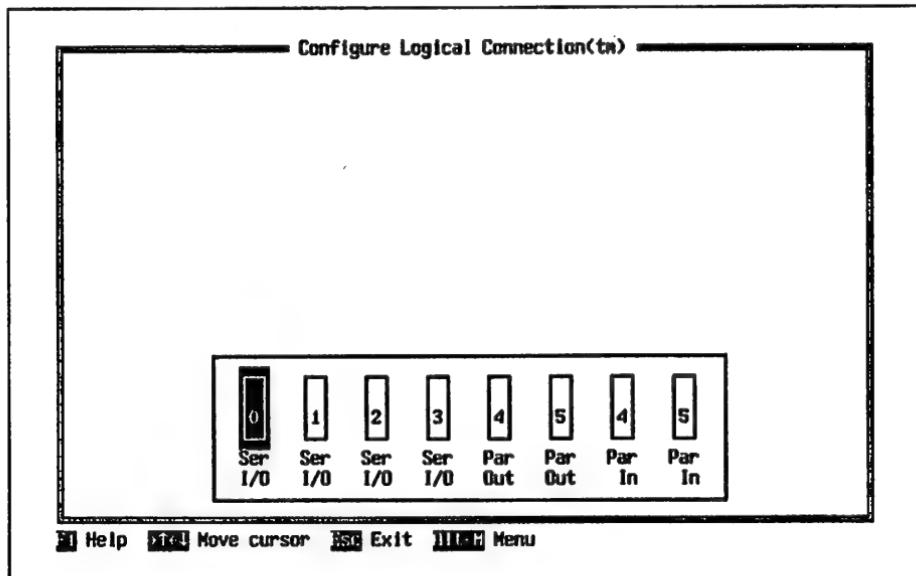
## Maneuvering in LCSETUP

The LCSETUP program uses some very simple conventions for getting around from screen to screen, entering data and making selections. Most of these conventions will appear on the bottom line of the screen.

For example, the line at the bottom of the Main Menu when we first see it tells us that pressing the **[F1]** key will call up "Help" information, the **[↑]**, **[↓]**, **[←]** and **[→]** keys move the cursor; the **[Home]** key moves to the first selection on a menu (or the beginning of a field) and the **[End]** key moves to the last selection (or the end of a field). Pressing the **[Enter]** key makes a selection.

These conventions will remain true throughout the LCSETUP program. In addition some other instructions will appear at the screen bottom when different kinds of information are asked for. If you are ever in doubt about what to do at a particular point, press the **[F1]** key for Help.

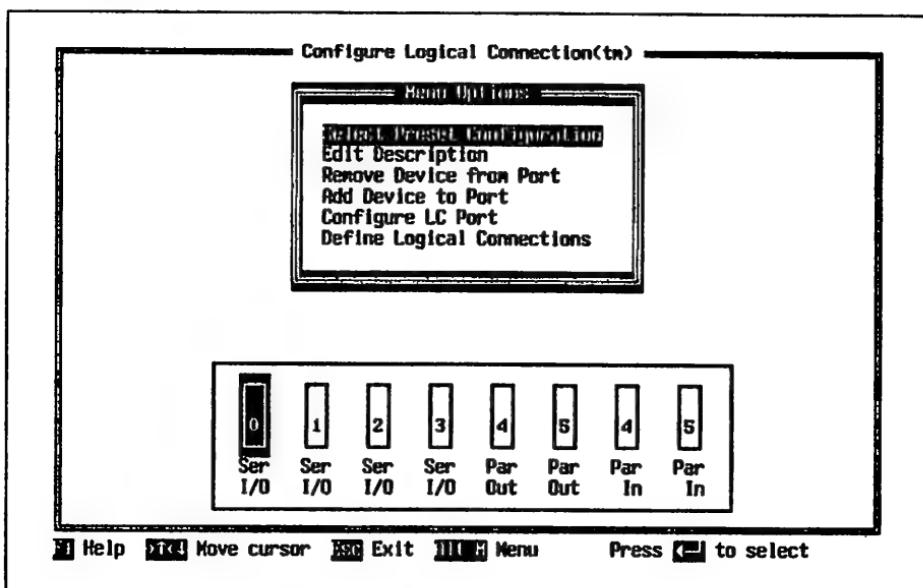
To try it out, press the **[←]** key while the cursor (in this case, a horizontal "light bar") is over the words "Configure Logical Connection". The screen below will appear:



As you can see, this is a diagram of The Logical Connection. You will configure your Logical Connection by "customizing" this diagram so that it shows and describes the devices you will have connected to it. Then, all you have to do is plug your equipment into The Logical Connection exactly like the customized diagram, and you'll be ready to start switching and sharing devices whenever you want.

## The ALT-M menu

You will notice a new legend at the bottom of the screen: "Alt-M Menu." Try it by holding down the **Alt** key while you press **M**. A little box of menu options will appear:

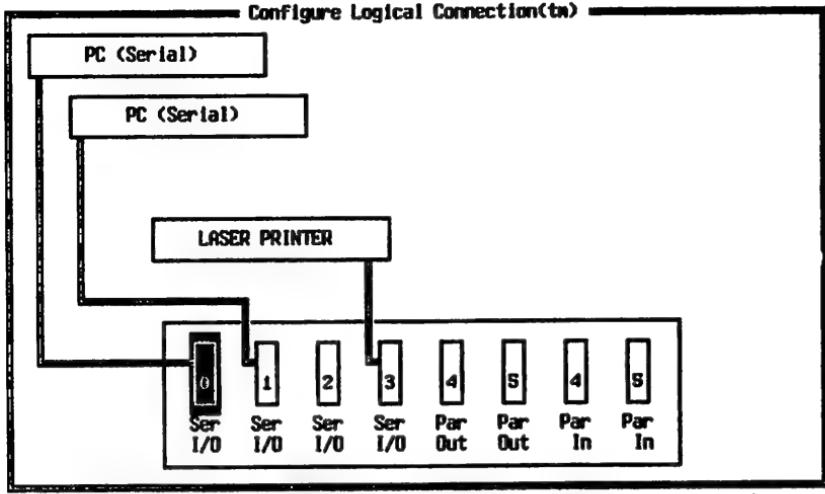


As in all the LCSETUP screens, you can move the cursor (light bar) with the arrow keys, make a selection with the **←** key or "escape" from the screen with the **Esc** key.

We will go through each of these options in the next chapter, but for now we are interested in the first item, "Select Preset Configuration." Since the light bar is already on this line, select it by pressing **←**.

The Menu box will vanish, and the Logical Connection picture on the screen will change.

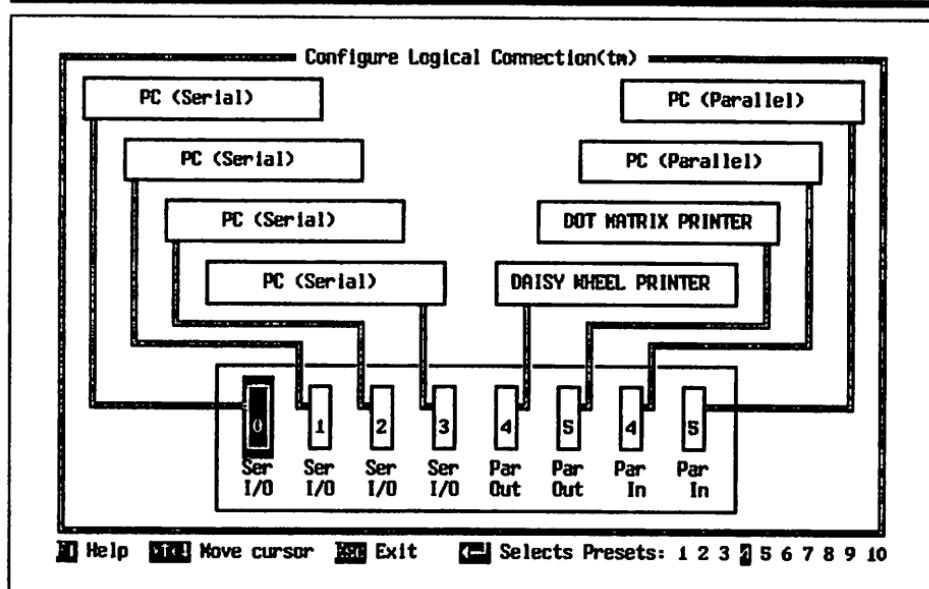
Configure Logical Connection(tn)



This is a diagram of the first Preset Configuration: a setup that allows two PC's to share a single serial printer. In this example, the PC's are connected to The Logical Connection from their serial (COM1 or COM2 ports).

**NOTE:** A PC's "standard" printer output is PARALLEL (LPT1 or LPT2). To send your PC's output to a printer through a SERIAL port, you must re-route the standard output with the DOS "MODE" command. This procedure is discussed fully later in this chapter.

There are ten of these preset configurations to choose from, corresponding to the numbers 1 - 10 at the bottom left of the screen. The cursor is now on number 1. Press the **→** key to move it to the right.

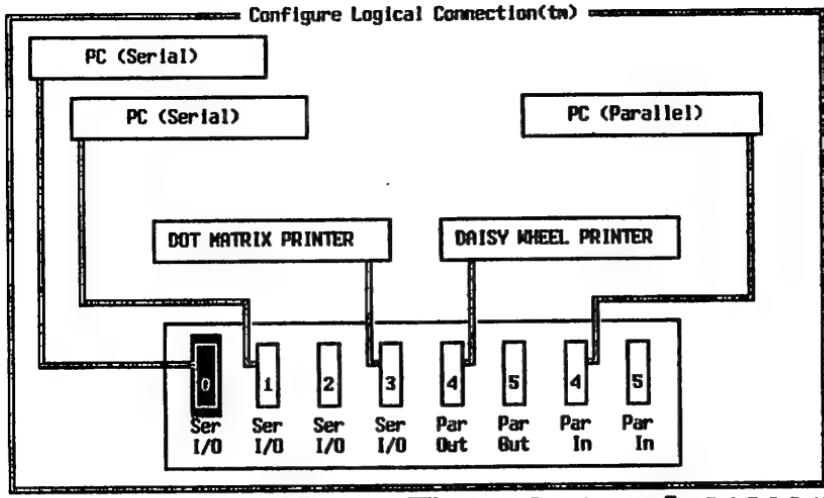


After pressing **→** 3 times, the cursor will have moved to number 4. At the same time, the **PRESET PICTURE** in the main box changed pictures each time. By using the **→** and **←** keys in this way, you can cycle through all 10 preset configurations, to see which one comes closest to meeting your needs. (All 10 presets are listed and described in **Appendix B.**)

## Choosing a setup

Suppose you have two PC's with serial ports, a serial printer and a parallel printer; and you want to let both computers switch between both printers. In this case, **Preset 3** will fill the bill, with minor modifications.

Configure Logical Connection(tm)



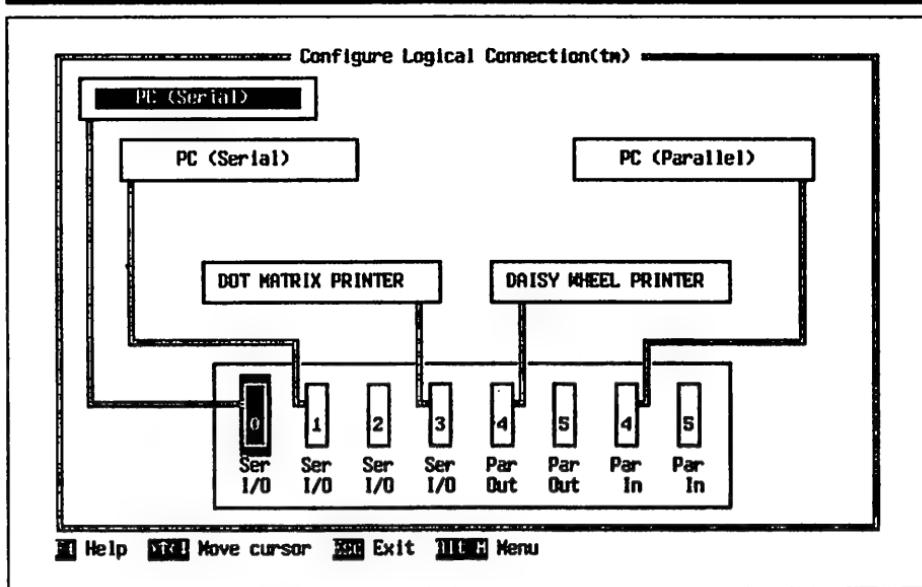
Help Move cursor Exit Selects Presets: 1 2 3 4 5 6 7 8 9 10

As the picture indicates, this setup is for 5 devices, described inside each little box that is connected to a port:

1. A PC (Serial) is connected to The Logical Connection's SERIAL #0 port.
2. A PC (Serial) is connected to the SERIAL #1 port.
3. A DOT MATRIX PRINTER is connected to the SERIAL #3 port.
4. A DAISY WHEEL PRINTER is connected to the PARALLEL OUT #4 port.
5. A PC (Parallel) is connected to the PARALLEL IN #4 port.

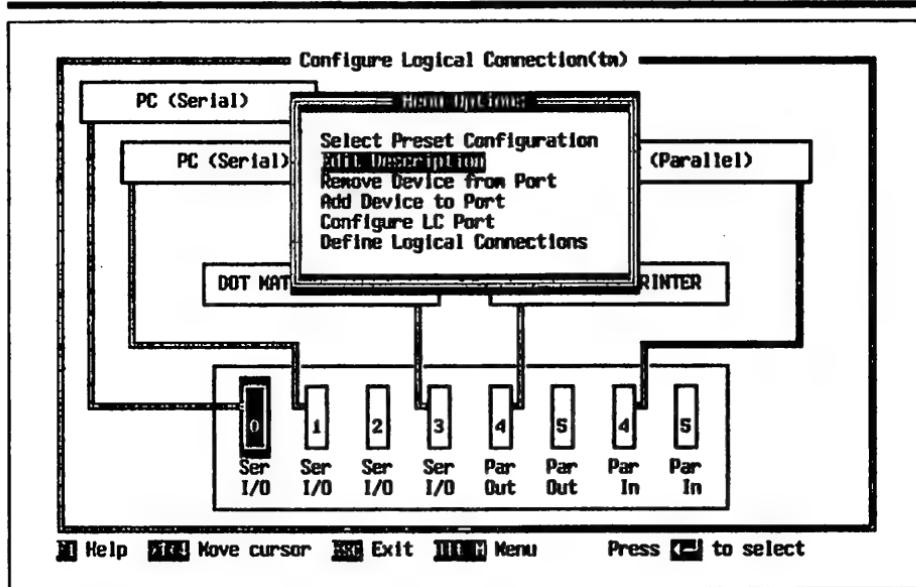
This configuration has one *extra* device (a PC connected through the PARALLEL IN #4 port), that you don't want to connect in this example. That's alright, you will be able to remove it. You will also be able to change the descriptions of the printers if they don't match what you have.

To begin this sample configuration, just press **[+]** to select Preset #3. The numbers at the bottom of the screen will disappear, and the light bar will show up *inside* the first little box.

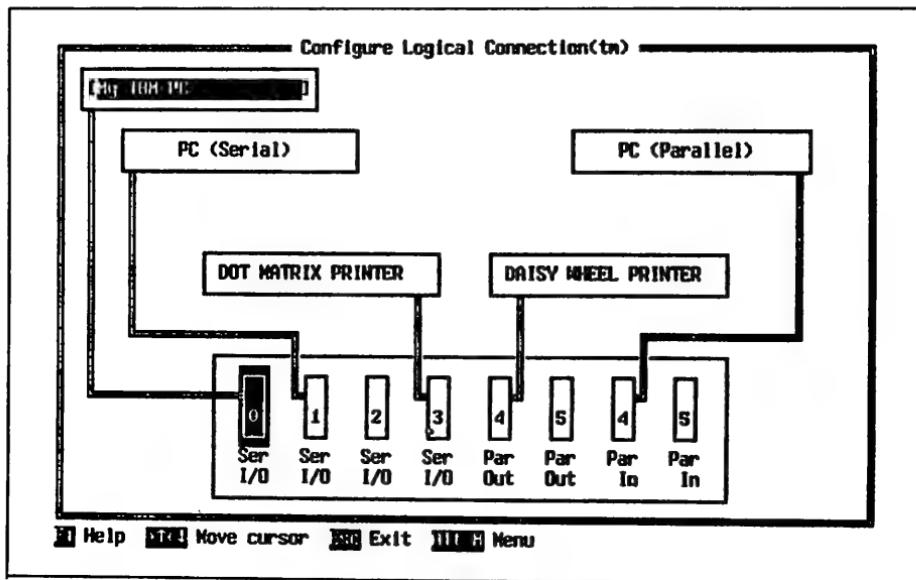


The description inside each box indicates what kind of device the port is configured for. In this preset, the SERIAL #0 port is meant to be connected to the serial port of a computer – for example, your PC's COM1 port.

Now, you should change these descriptions to labels that mean something to *you*. To do this, enter the **ALT-M** menu by pressing **Alt-[M]**, and move the light bar to the second selection “Edit Description”.



When the menu disappears, brackets will appear around the existing description, indicating that you are in edit mode, and what you type will write over it. (You can also get into edit mode directly from the main screen, simply by positioning the light bar over the port and starting to type your new description).



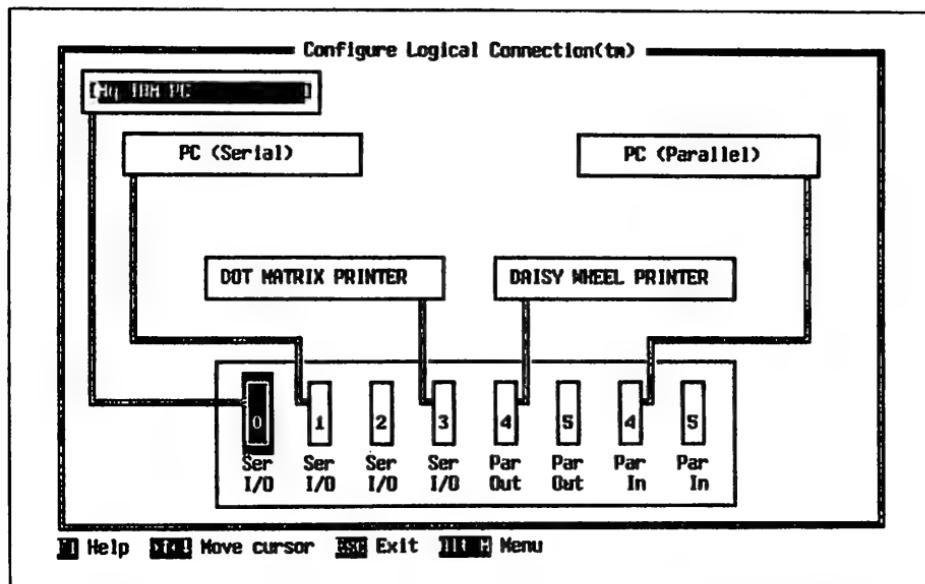
## Editing features

When you are in the LCSETUP program's **edit mode**, these editing keys are available to you:

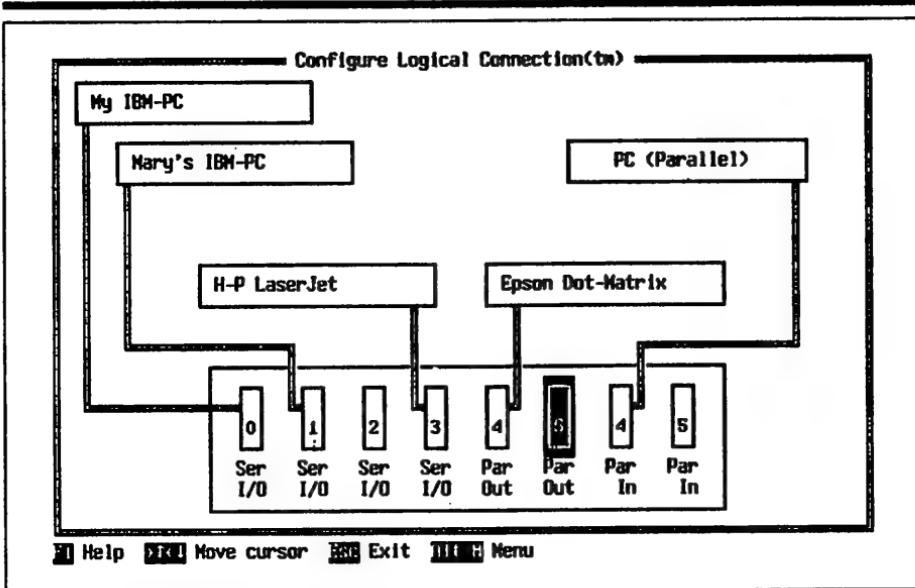
- **BkSp**: Move cursor left and erase one character.
- **Del**: Erase the character at the cursor position.
- **Ins**: Insert a blank space at the cursor position.
- **←**: Move cursor one character to the left.
- **→**: Move cursor one character to the right.
- **Home**: Move cursor to the beginning of the line.
- **End**: Move cursor to the end of the line.
- **→**: Accept the line as you see it.

Typing any character over an existing character replaces the old character with the new one.

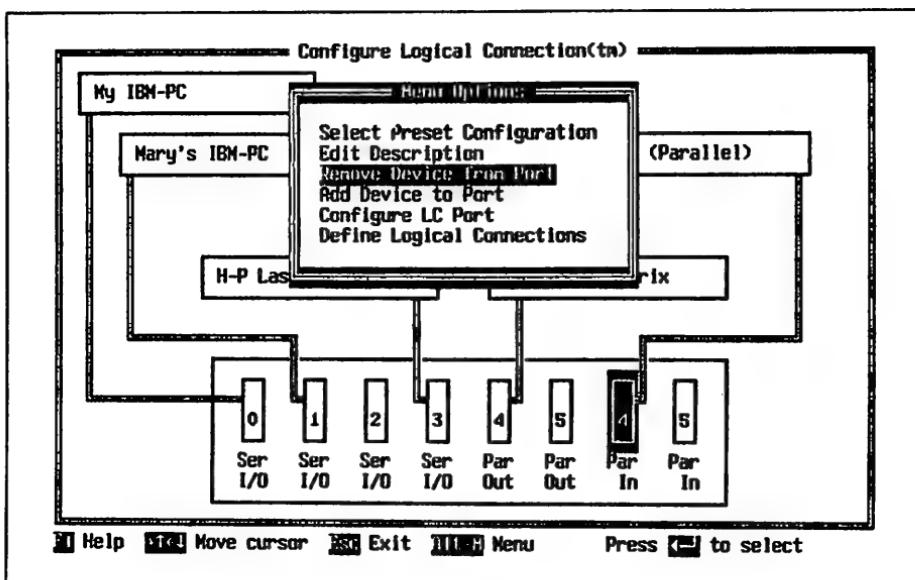
When your new description looks like you want it to, press the **→** key. Your description is now entered in the box, and the light bar moves to the next port.



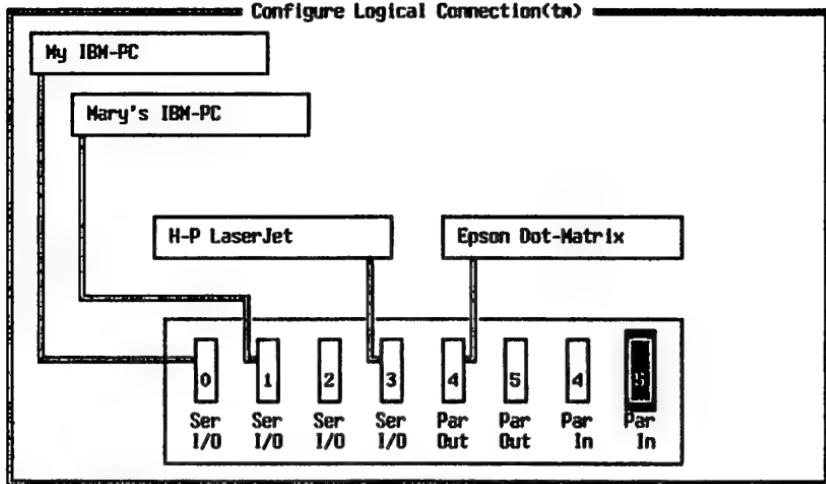
Now do the same thing for each port you are using in your configuration. For example, if your second PC belongs to Mary, your **Serial Printer** is a Hewlett Packard LaserJet and your **Parallel Printer** is an Epson Dot-Matrix, your descriptions might look like the following screen:



All you have to do now is to remove the unwanted PC on the PARALLEL IN #4 port. To do this, position the light bar over the port, press **Alt-M** and choose the third selection, "Remove Device From Port".

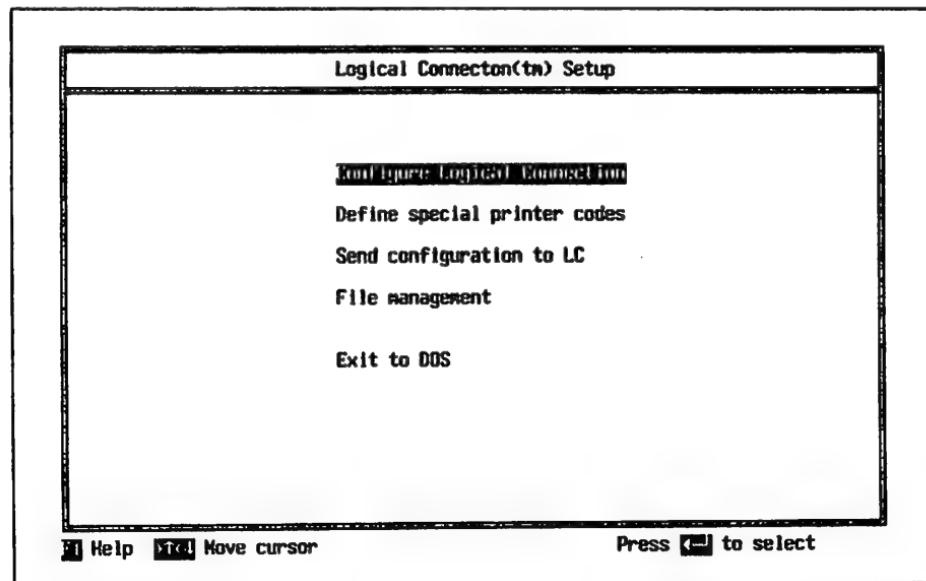


When you press **←**, the menu will disappear and the unwanted port will be removed:



When everything looks like you want it to, press the **Esc** key to return to the main menu.

## **Sending your setup to the LC**

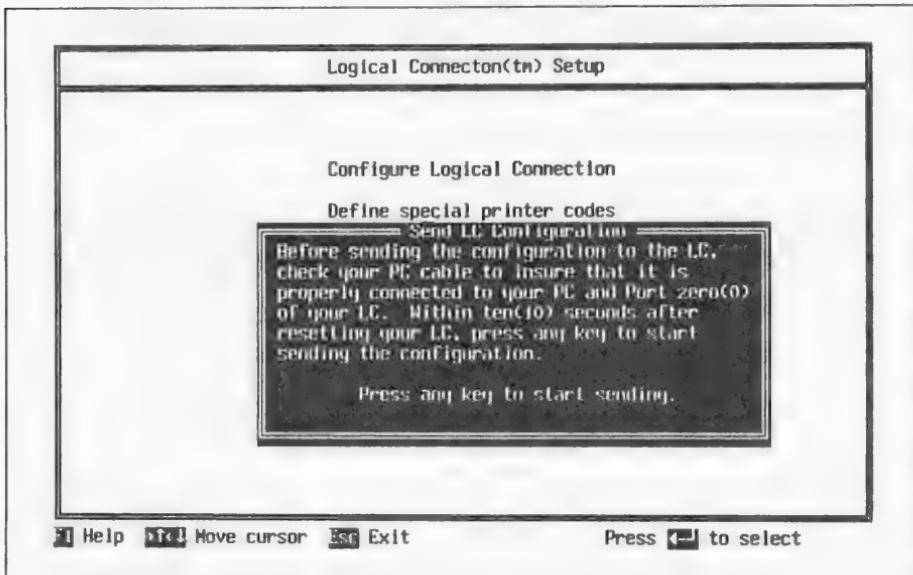


Before you can send your configuration to **The Logical Connection**, you

must make sure that it is properly connected and powered up. Remember:

- One end of the PC Serial Cable is plugged into your PC's COM1 or COM2 serial port.
- The other end is plugged into **The Logical Connection's SERIAL #0 port**.
- The little plug at the end of the transformer cord is plugged into the 3-prong socket at the left edge of **The Logical Connection**.
- The **power transformer** is plugged into a standard 110-120V electrical wall outlet.
- Your serial port should be configured with the DOS "MODE" command to **MODE 9600,n,8,1**.

When you are satisfied that everything is connected properly, choose "Send configuration to LC" on the menu (by pushing the **+** key twice) and press **←** to select it. You'll see the following message:



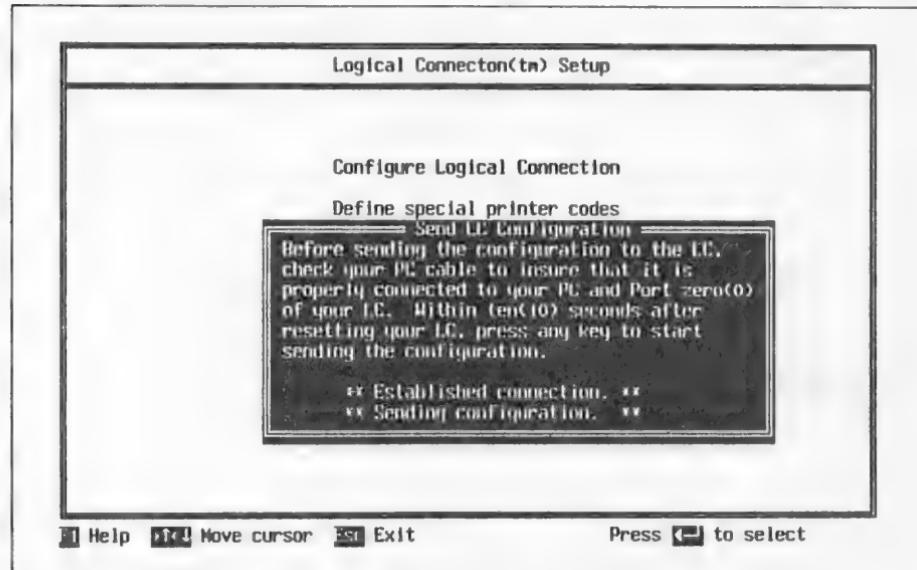
The configuration you have selected will actually be stored in battery-backed RAM (Random Access Memory) inside **The Logical Connection**, so it will "remember" how you have everything set up even if you leave it unplugged for a long time. It will also be written to a special file named "CONFIG.LC" on your \LC directory (or the copy of your Utility Program Disk, if you are running LCSETUP from a floppy diskette). We will discuss this file later.

To avoid the chance of *accidentally* altering what is stored in **The Logical Connection's** RAM, it can only be accessed in the first few seconds after **The Logical Connection** is **RESET**.

That is why it is important to follow the instructions on this screen carefully, and in exactly this order:

1. **FIRST**, press the **RESET** button on the left edge of **The Logical Connection**. You will know it has been reset by the fact that the **STATUS LED** will turn **ON**, and the **RUN LED** will begin to **FLASH** rapidly. Then,
2. **WITHIN TEN SECONDS**, press the **→** key (or *any* key on your PC's keyboard) to start sending your configuration to **The Logical Connection**.

The last line in your "Send LC Configuration" screen will change to "Starting communications through COM1 [or COM2]," then "Established connection." Finally, the message "Sending configuration" will be added.



When the configuration has been sent, the menu box will vanish, returning you to the main menu.

If the program *cannot* communicate with **The Logical Connection** within 20 seconds (or if you terminate the process by pressing the **Esc** key), you will see this screen:

## Configure Logical Connection

## Define special printer codes

Did not establish communication with the L.C.

Press any key to continue.

[1] Help [2] Move cursor [3] Exit

Press [ ] to select

If this happens, check your cable, transformer and LED's to make sure everything is set up properly, then try again. Remember to start sending the configuration *within ten seconds* of pressing the **RESET** button.

After your configuration has successfully been sent to **The Logical Connection** and the window disappears, move the light bar to the last item on the main menu, "Exit to DOS," and press [ ].

**The Logical Connection** is now internally configured, and you may unplug it if you wish. Your configuration will not be lost.

## Hooking up your devices

Since you are using IBM-PC or compatible equipment, connecting your devices to **The Logical Connection** will be easy:

1. For printers
  - a. Get the cable provided by the manufacturer to connect the printer to your PC. This is probably the cable you are already using.
  - b. Plug the "printer" end of the cable into the printer.
  - c. Plug the "computer" end of the cable into **The Logical Connection** port set up for it. (If you are using **Preset**

---

**Configuration #1**, for example, you will plug your LaserJet into the SERIAL #2 port and your Parallel Printer into the PARALLEL OUT #4 port.

2. For computers

- a. Plug each PC into the port set up for it on the Preset Configuration.
- b. If it is a serial connection, use the same red PC Serial Cable you configured The Logical Connection with.
- c. If it is a parallel connection, use a straight-through cable with a male DB-25 connector on the end plugged into The Logical Connection and a female DB-25 connector on the end plugged into the PC. (If you have trouble purchasing such a cable locally, you may order it direct from Fifth Generation Systems. Just call the TOLL-FREE Technical Support number listed in Appendix F.

For a more complete discussion of cables, refer to Appendix A.

## Switching printers

When the LCSETUP program sent your configuration to The Logical Connection, it also created a special file in your \LC directory (or your copy of Utility Program Disk) named CONFIG.LC. This file contains all of the configuration information, including the "selection strings" (special 9-character switching codes) that will tell The Logical Connection to switch each computer's output from one printer to another.

Another program, POPLC.EXE, is also on the Utility Program Disk (and \LC directory). POPLC is a *memory-resident* program which reads the CONFIG.LC file and switches connections for you. Complete instructions for using POPLC appear in Chapter 6.

POPLC is a *memory-resident* program, which simply means that once you "load" it into your computer's memory, it *stays* there even when it is not being used. The advantage of this is that it is always available instantly, *even when you are in the middle of another program*. So if you printing a LOTUS 1-2-3 graphics chart on a dot-matrix printer, you can "pop-up" a simple menu and switch to a letter-quality printer to print a worksheet summary, without ever leaving 1-2-3.

## Getting ready

Since POPLC can be used independently by each PC plugged into The Logical Connection, each PC must have its own copy of both POPLC and the CONFIG.LC file that describes your configuration. The easiest way to do this is to copy your entire \LC directory to a floppy diskette (for example: **COPY C:\LC\\*.\* A: ↵**), make a new \LC directory on each PC (**MD \LC ↵**), then copy all the files from the diskette into each PC's \LC directory (type **COPY A:.\* \LC ↵**). If you need more information about copying files from disk to disk, consult your DOS manual.

Be sure to make these copies *after* you have configured The Logical Connection, so that each PC will have the *same* CONFIG.LC file.

## Using the MODE command

When you print a document, either with the DOS "PRINT" command or with most software applications, DOS sends the output to its "standard" printer port (which is normally LPT1). If your Logical Connection is connected to your PC's serial port (COM1 or COM2) or to a second parallel port (LPT2), you must use the DOS "MODE" command to re-route your printer output to the correct port. This command takes the form

**MODE LPT1:=COM1: ↵**

After you type this command (at the DOS prompt), anything you print will go out through your COM1 serial port instead of your regular parallel printer port. (Of course you may substitute COM2 or LPT2 in the command, if you are using one of these ports instead).

The MODE command remains in effect *only until you turn off or re-boot your computer*. Then, you must issue the command again, or your output will once more go to the standard printer port. The best way of handling this problem is to insert the MODE command into your AUTOEXEC.BAT file, so it will be automatically executed each time you start up. You may also wish to insert the command

**MODE COM1:9600,N,8,1**

into your AUTOTEXEC.BAT file, mentioned earlier in this chapter, to insure that your serial port's setup parameters match the default settings on The Logical Connection. For more information on the MODE command, consult your DOS manual.

**NOTE - You must NOT set the optional "P" flag for your serial ports when using the MODE command. This may interfere with proper operation of The Logical Connection in some circumstances (especially during configuration).**

## **Loading POPLC**

To load POPLC from your hard disk, type:

**CD \LC ↵  
POPLC [LC=LC Port PC=PC Port] ↵**

where *LC Port* is the Logical Connection port you have plugged your PC into (0,1,2,3,4 or 5), and *PC Port* is the port on your PC that you have plugged The Logical Connection into (COM1, COM2, LPT1 or LPT2). If you do not specify these ports, POPLC will default to **LC=0 PC=COM1**.

To load POPLC from your Utility Program Disk, put the disk in your PC's A: drive and type:

**A: ↵  
POPLC [LC=LC Port PC=PC Port] ↵**

You will immediately see the following screen:

```
C>poplc lc=0 pc=com1      Pop-Up =  
                                Pop-Up Logical Connection v1.5  
Copyright 1987, Fifth Generation Systems, Inc.  
Portions of this product are  
Copyright 1985 Popular Programs, Inc.  
Press ALT-L for Logical Connection.
```

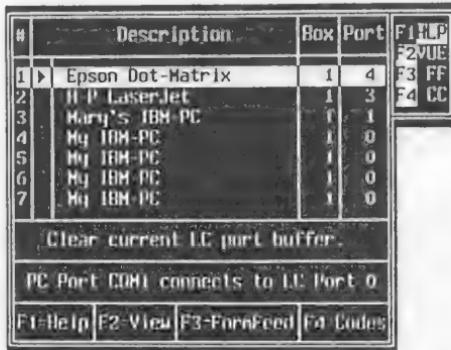
C>

This means that POPLC is loaded. You may use it now, or just leave it in memory until you need it. It will stay loaded until you reset or turn off your PC. (If you use the LCSETUP program to *change* your configuration while POPLC is loaded, you must *re-load* POPLC by repeating the commands listed above, so that it will read the new CONFIG.LC file.)

## Using POPLC

Using POPLC to switch connections is easy. Whenever you want to switch your PC's output from one printer or peripheral to another, just press **Alt-L**. A little window will "pop-up" on the screen, with the names of your devices. If you installed **Preset #3** according to the example in this chapter, for instance, this window would pop up:

C>



You will notice that the light bar is on the first line, "Epson Dot-Matrix", and that there is a little triangle in the column to the left. The triangle indicates what device is currently selected.

The first line on the menu is your "default" selection – if **The Logical Connection** receives *no* switching instructions it will connect to this device automatically whenever it is first powered-up or RESET. To avoid any possible confusion arising from this automatic default, it is a good idea to call up POPLC and "switch" to the device you want when you first turn on your PC and **Logical Connection** each morning.

To switch connections, first use the **↓** key to move the light bar over the device you want to switch to. For example:

C>

#	Description	Box	Port	F1-Help	F2-View
1	Epson Dot-Matrix	1	4	F3 FF	
2	HP LaserJet	1	3	F4 CC	
3	Harry's IBM-PC	1	1		
4	Hu IBM-PC	1	0		
5	Hu IBM-PC	1	0		
6	Hu IBM-PC	1	0		
7	Hu IBM-PC	1	0		

Clear current LC port buffer.

PC Port COM1 connects to LC Port 0

F1=Help F2=View F3=FormFeed F4=Codes

If you now press **←**, the POPLC menu will disappear and you will be returned to wherever you were when you called it. From now on, however, (until you “pop up” the program and switch connections again) everything you print will go to the LaserJet printer that is plugged into the LC’s SERIAL #3 port. The fact that you have switched your output from a parallel to a serial printer need not concern you, nor do you have to change any settings on your PC: **The Logical Connection** performs all the necessary conversions and handles all these details for you.

While these simple instructions are all you need to be able to switch connections instantly, the POPLC program contains many other useful features, which are described fully in **Chapter 6**. The LCSETUP program also offers many other options and functions, which are explained in **Chapter 6**. Even if you get your **Logical Connection** up and running with a preset configuration and the “quick start” instructions in this chapter, you should still read the remainder of **Part II** to gain a deeper insight into **The Logical Connection** and its many capabilities.



# Chapter 5

## The Configuration Process

In this chapter you will learn:

- How to configure your Logical Connection with the LCSETUP program.
- How to set the baud rate, parity, word length, handshaking protocol, time out and form feed for each port.
- How to make a FIXED connection.
- How to make a SWITCHABLE connection.
- How to save and recall your configurations with file operations.

### Running the LCSETUP Program

This chapter assumes that you have read the previous chapter, "A Quick Start," and that

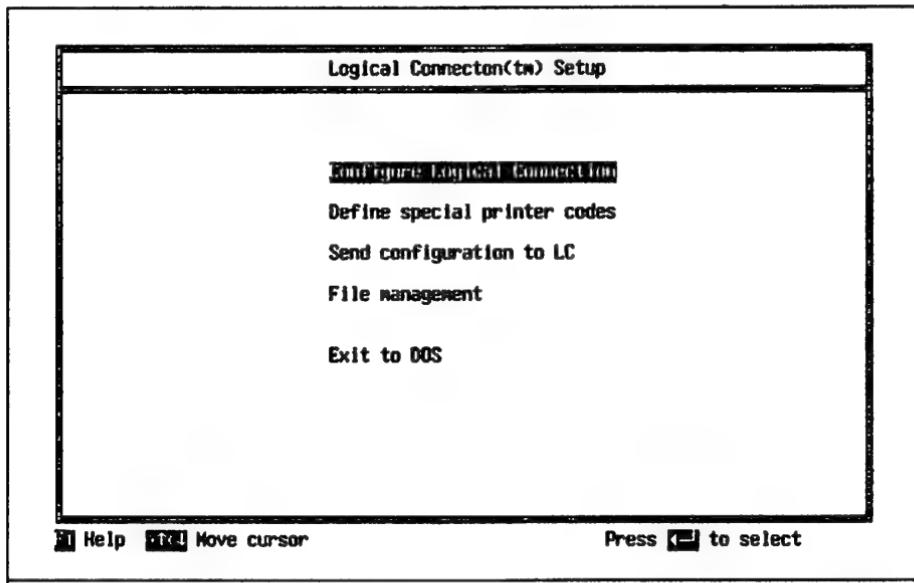
1. Your Logical Connection is correctly powered up.
2. The red PC-Serial Cable is connected from the SERIAL #0 port to your PC's COM1 serial port.
3. You have correctly configured the port with the **MODE Com1:9600,N,8,1** command.
4. Your Logical Connection utility programs have been installed on your hard disk.

Complete instructions for these procedures are given in Chapter 4. To begin the configuration process, call the LCSETUP program by typing (at the DOS prompt):

**CD \LC**   
**LCSETUP [LC=COM2] [SNOW]** 

where the **LC=COM2** option is used to connect The Logical Connection to your PC's COM2 serial port (COM1 is the default), and the **SNOW** option is used to eliminate the fuzzy video "snow" that may appear when using LCSETUP with certain graphics adapter cards.

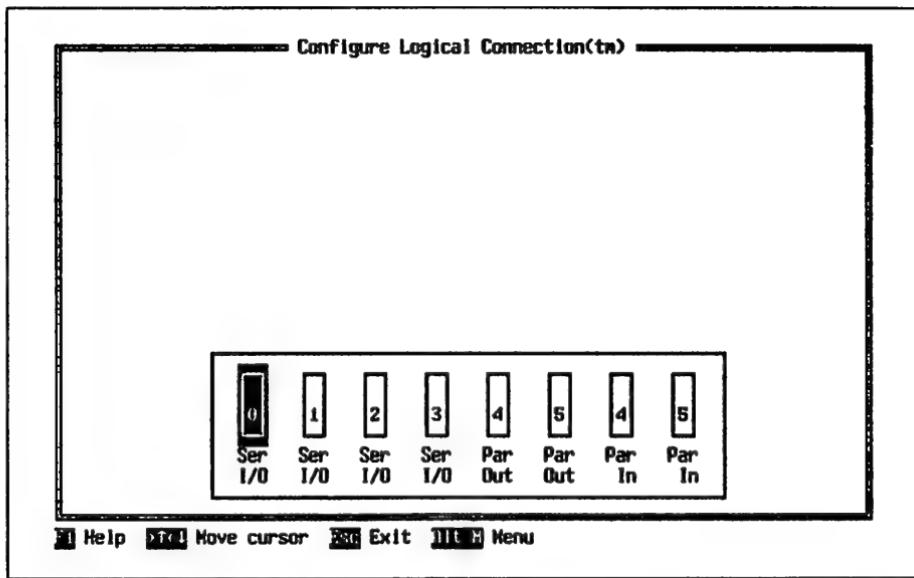
## The Main Menu



When LCSETUP's main menu comes up, the first selection, "Configure Logical Connection," will be highlighted. Simply press the  key to select this choice.

You will be presented with the "Configure Logical Connection" screen:

# The Configuration Screen



This screen is actually a miniature diagram of **The Logical Connection**. You will configure your **Logical Connection** by:

1. Editing this diagram to add devices to the ports of your choice, and entering descriptions of each device.
2. “Configuring” each port in terms of baud rate, parity, word length and other parameters, so **The Logical Connection** will know how to “talk” to the device plugged into the port.
3. Defining the “logical connections” you want to make among your devices – in other words, how you want to be able to switch and share among them.

We will cover each of these steps by “walking through” a sample configuration. To get the most from these instructions, you should treat this as a **hands-on tutorial**, and actually *create* the sample configuration on your PC as you follow along in the manual.

For this sample configuration, we will assume that you have:

1. Two PC's (with serial ports),
2. A laser printer, and
3. A dot-matrix printer.

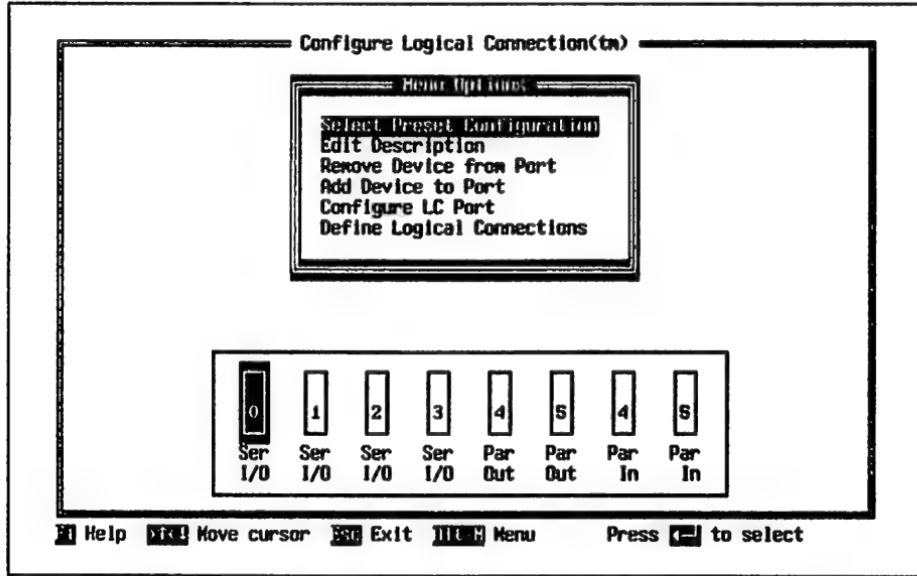
We'll also assume that you want to give both computers "switch and share" access to both printers.

## Adding a device to a port

The first step is to add each of your devices to ports on the Logical Connection diagram. We will start by putting the first PC on The Logical Connection's SERIAL #0 port. Notice that the screen cursor (light bar) is highlighting this port. You can move the light bar with the **←** and **→** keys. For now, leave it on the SERIAL #0 port.

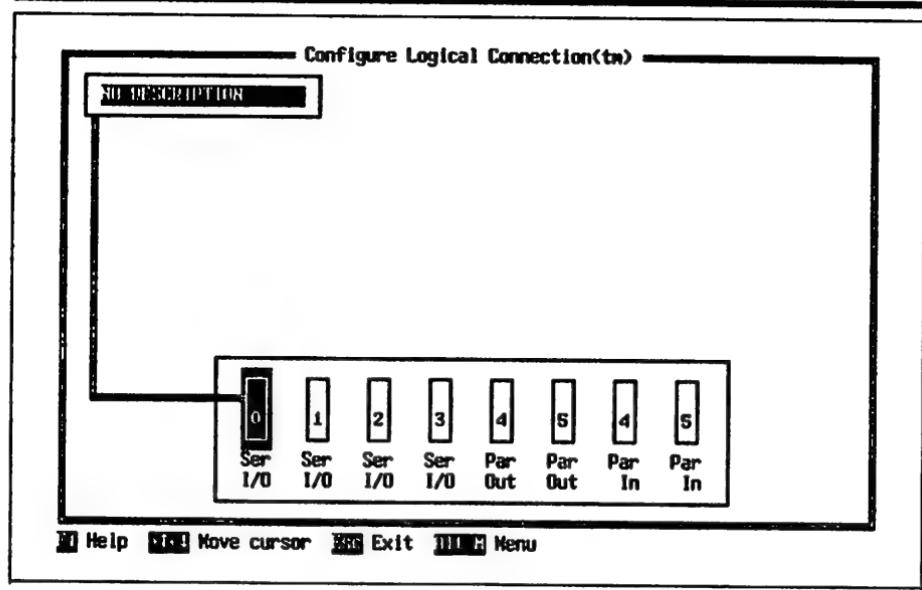
### The ALT-M menu

Along the bottom of the screen is a set of instructions about what you can do, including "Alt-M Menu." Call up this menu by holding down the **Alt** key while you press **M**. A box of menu options will appear:



As in all the LCSETUP screens, you can move the cursor (light bar) with the arrow keys, make a selection with the **→** key or "escape" from the screen with the **Esc** key.

Move the light bar to the fourth selection, "Add Device to Port," and press **→**. The menu box will disappear, and a little box labeled "NO DESCRIPTION" will be connected to the SERIAL #0 port:



## Editing a description box

Now you must edit the label inside the box, so that it describes the device you will be connecting to the SERIAL #0 port. Enter edit mode by pressing **[Alt]-[M]** and selecting the second choice, "Edit Description". You can also enter edit mode directly, simply by starting to type your description while the field you want to edit is highlighted. Either way, you'll see **[brackets]** around the field to indicate you are in edit mode.

## Editing features

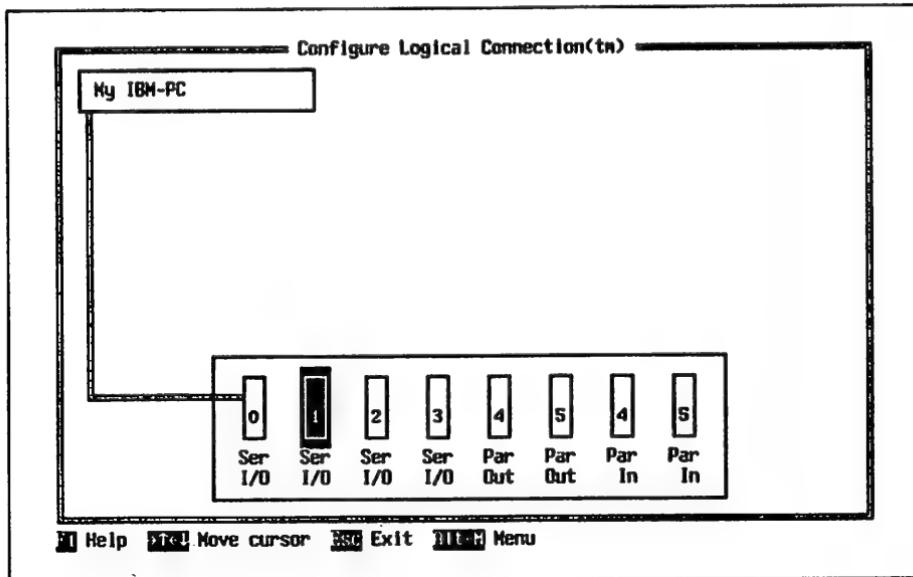
When you are in the LCSETUP program's **edit mode**, these editing keys are available to you:

- [BkSp]**: Move cursor left and erase one character.
- [Del]**: Erase the character at the cursor position.
- [Ins]**: Insert a blank space at the cursor position.
- [←]**: Move cursor one character to the left.
- [→]**: Move cursor one character to the right.
- [Home]**: Move cursor to the beginning of the line.
- [End]**: Move cursor to the end of the line.
- [←]**: Accept the line as you see it.

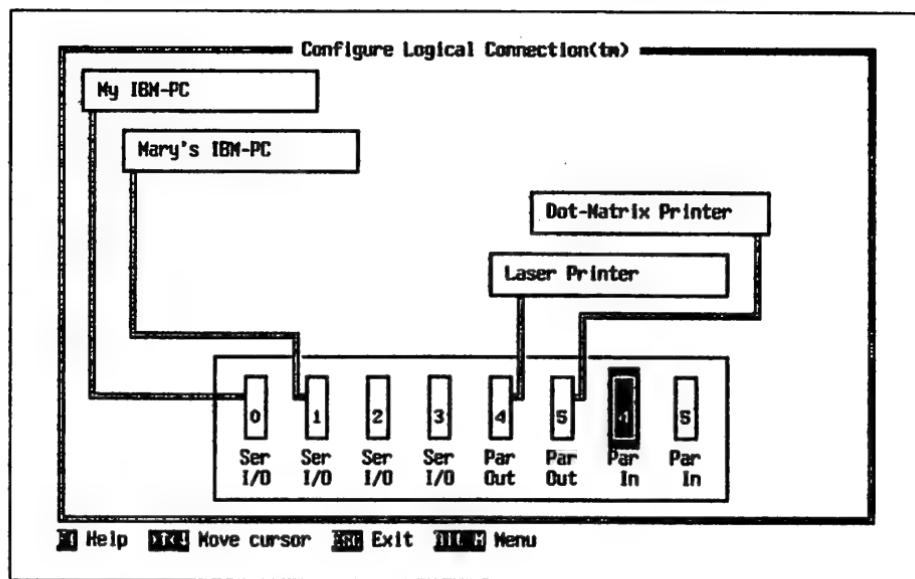
Typing any character over an existing character replaces the old character with the new one.

Since your first device is a PC, type "My IBM-PC" in the box, overwriting the words "NO DESCRIPTION." Use the **[Del]** key to remove the remaining unwanted characters.

When your new description looks like you want it to, press the **[←]** key. Your description is now entered in the box, and the light bar moves to the next port.



Now you can add the rest of the devices for this example, using the same procedure, so that your screen ends up looking like this:

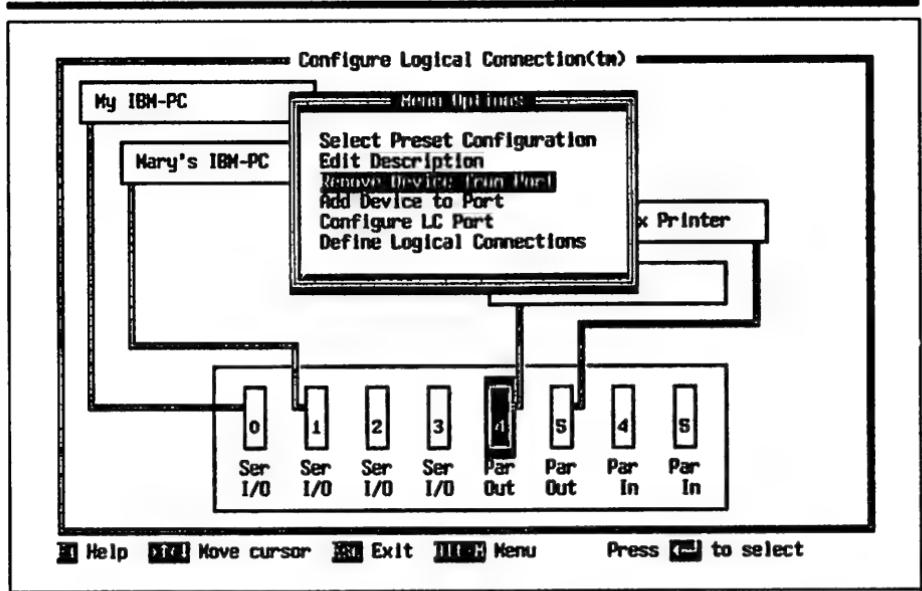


## Removing a device from a port

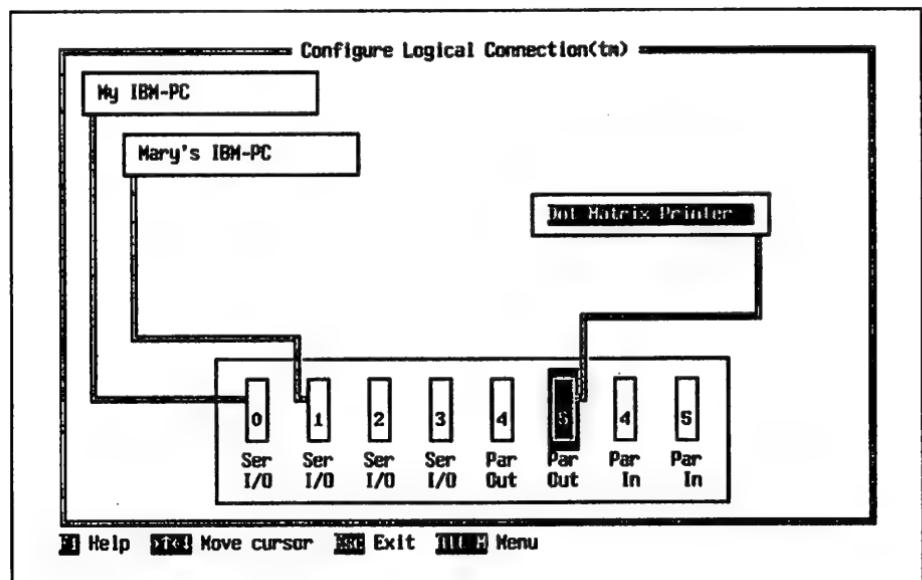
Notice that both printers are connected to The Logical Connection's PARALLEL OUT ports. This is correct, if they are both parallel printers. (You would use a PARALLEL IN port to connect to your PC's LPT1 or LPT2 port).

But what if you belatedly realize that your Laser Printer is not a *parallel* printer, but *serial*? You will have to remove it.

To do this, press **Rit-M** to call up the menu options, while the light bar is on the PARALLEL OUT #4 port. Choose the third item, "Remove Device from Port."

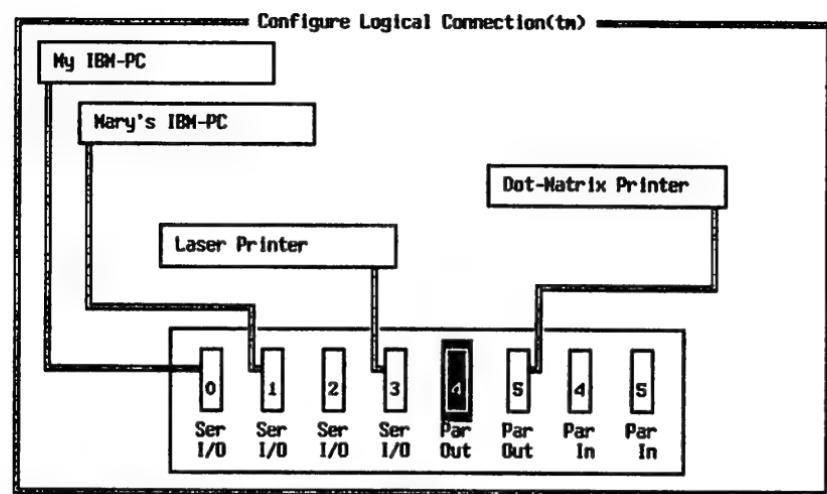


When you press **[Alt]**, the Menu Options box will disappear, and the unwanted device description will be removed.



Removing a device, like the other Menu Options (in the **ALT-M** menu), can also be done through the "shortcut" method of positioning the light bar over the device and holding down the **[Alt]** key while pressing the first letter of the desired option (in this case, you would press **[Alt]-[R]**).

Now you can *add* the Laser Printer to the SERIAL #3 port, where it should be:



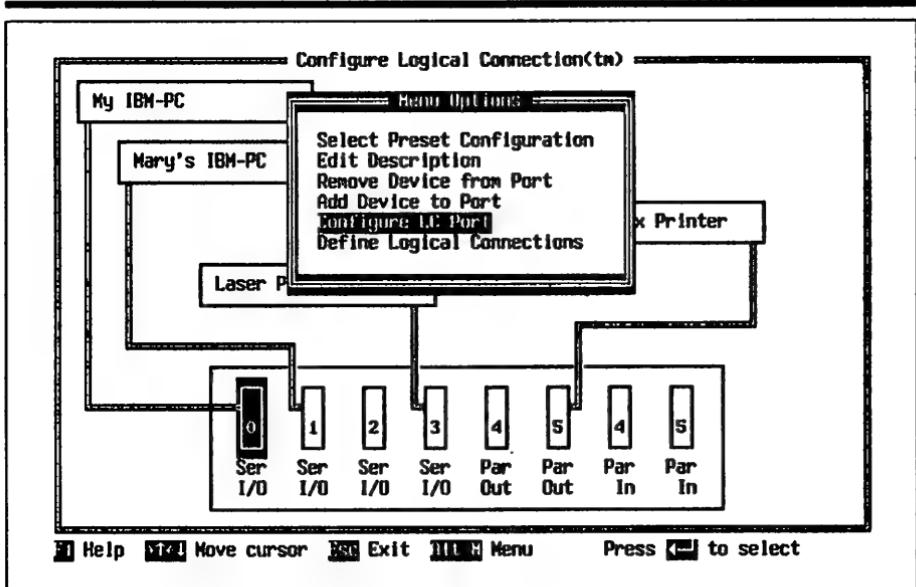
## Configuring the ports

Now that you have indicated what devices you will be connecting to each Logical Connection port, the next step is to "configure" each port so that The Logical Connection will know how to communicate with the device plugged into it.

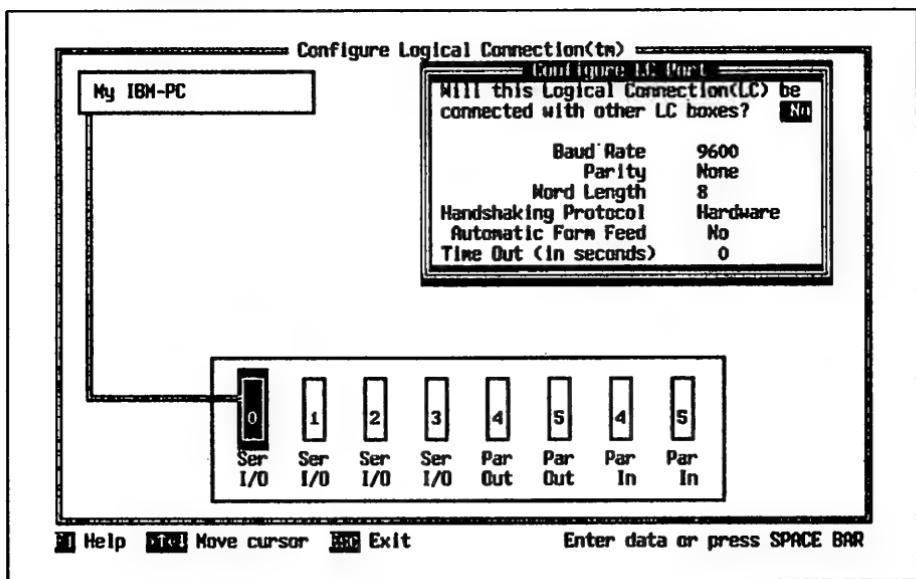
For example, The Logical Connection can "talk" to serial devices at any baud rate from 300 to 9600 – but it has to know *which* rate the device is expecting, or it will not be able to establish communications.

### The Serial Ports

To begin this part of the process, start with the first port you will have in use (in our example, the SERIAL #0 port). Put the light bar on that port, then call up the Alt-M Menu Options.



Select the second-to-last option, "Configure LC Port," and press **[ ]**. The following screen will appear:



In the upper right-hand corner you will see the question, "Will this Logical Connection (LC) be connected with other LC boxes?" This is a *special feature* of the SERIAL #0 port that allows you to put it in "network" (RS-485) or modem-multiplexing mode. Since these

advanced features will be described in Chapter 7 we will pass over them here.

The other settings you see here are the “default” settings for a serial port that will be connected to a computer. If you are using your PC’s COM1 or COM2 port for most purposes, these defaults will be appropriate.

Be sure to use the DOS **MODE** command to set your PC’s serial port configuration to match the settings listed here. The first three settings are equivalent to the first three parameters in the **MODE** command. That is, the command **MODE COM1:9600,n,8,1** sets the port to 9600 baud, no parity, a word length of 8 bits and 1 stop bit. (The Logical Connection automatically recognizes the stop bit, so it isn’t listed on this menu.

If you are using another kind of serial device (or if you want to set your PC serial port differently), you should check the manual of that device to determine the proper settings for each parameter. To change the settings, just position the cursor over the field you want to change and type in the new information. (Some fields have a limited number of choices that you can “toggle” through by pressing the SPACE BAR. When this is the case, the message in the lower right corner of the screen will say so.)

Here is a brief description of each of these fields:

#### **Baud Rate**

The speed (roughly equivalent to “bits per second”) at which data is transferred between serial devices. The baud rate for this port **MUST** match the device it’s connected to, or no communication will occur.

#### **Parity**

An error-detection system used by many serial communication devices, consisting of an extra bit added to each word. For **EVEN** parity, the bit is set if the total number of 1’s in the data word are odd; for **ODD** parity, the bit is set if the total number of 1’s in the data word are even. (This even *sounds* odd!)

#### **Word Length**

Each character that is transmitted over a serial device is made up of several bits. The number of bits per character is called the **word length**. This may be 6, 7 or 8.

## Handshaking Protocol

Different schemes exist to tell the devices on each end of a serial channel when to "talk" and when to "listen." The scheme used is called the **handshaking protocol**. Study the manual for the device you are connecting to choose the correct protocol.

One word of caution: if you are sending compiled programs or other *binary* data, you should choose *hardware* protocol for the link between your computer and **The Logical Connection**. This is because **The Logical Connection** will otherwise strip bytes having the same values as XON/XOFF from the data stream.

## Automatic Form Feed

If you wish, **The Logical Connection** will automatically send a form-feed character when it switches a new data stream to a printer. Normally you should answer this YES if the device you are connecting is a printer, and NO if it is anything else.

## Time Out

You must define a Time Out period to tell **The Logical Connection** how to manage competing data streams when several computers want to use the same printer. **The Logical Connection** gives control of the printer to the first computer until nothing is received for the Time Out period; then it switches control to the next waiting computer. (In the meantime, anything sent to the printer by other computers is *spooled* (stored in **The Logical Connection**'s buffer) so the computer won't get "hung up" waiting.

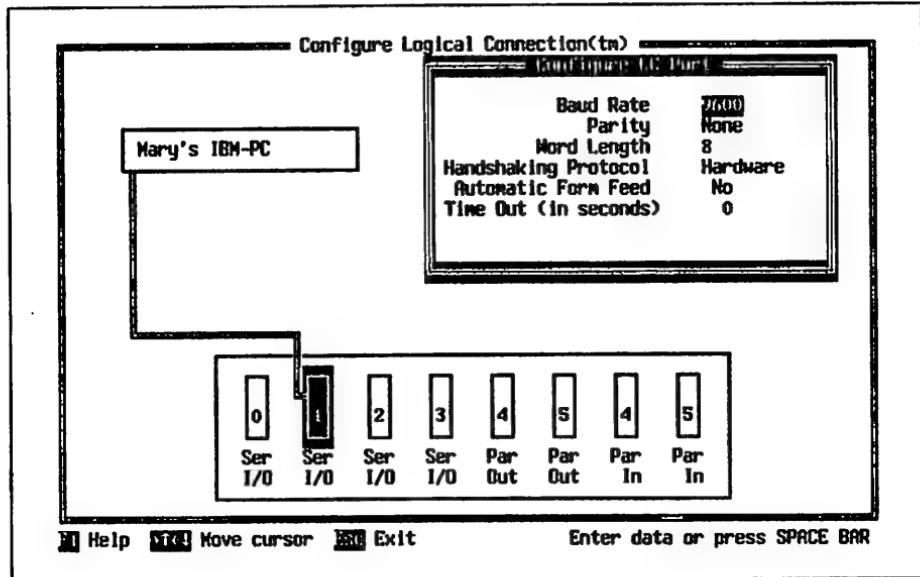
Since you must answer all these questions for *each* serial device you have connected, it is a good idea to look up the required answers in advance and have them on hand when you sit down to configure **The Logical Connection**. The Configuration Assignment Form supplied to you with this manual is a convenient place to jot down this information.

Once you are satisfied that the configuration questions for the SERIAL #0 port, "My IBM-PC," have been answered correctly, you must move to the next port, "Mary's IBM-PC". You can press **Esc** to exit the "Configure LC Port" window, move the light bar to the SERIAL #1 port, then type **Alt-C** (or call up the ALT-M menu options and make your choice).

## Moving to the next port with **Ctrl**-**→**.

There is a shortcut, however. You can move *directly* from this “Configure LC Port” screen to the same screen for any other port, by holding down the **Ctrl** key while pressing the **→** or **←** key to move to the next port.

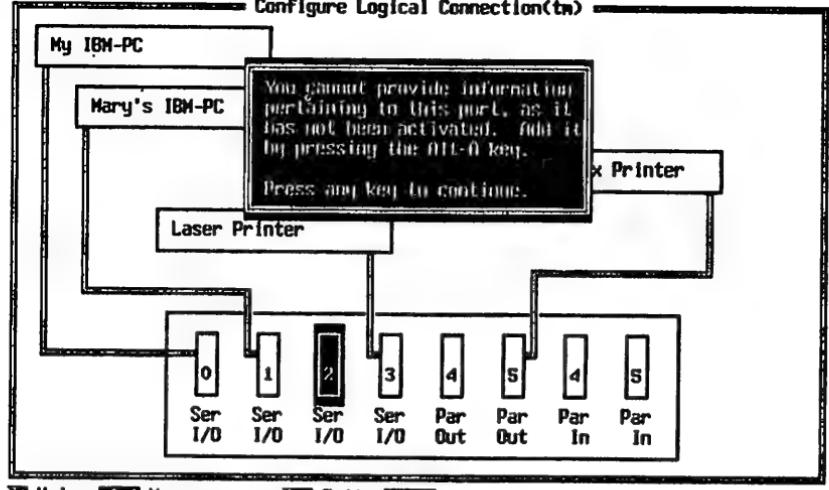
Try it now. Press **Ctrl**-**→**, and the screen for the SERIAL #1 port will open up before you.



As you can see, the questions on this screen are identical to those for the SERIAL #0 port, except for the *first* question about connecting to other LC boxes. Multi-box networks and “daisy-chained” configurations *must* be linked together with their SERIAL #0 ports, so the question doesn’t apply anywhere else.

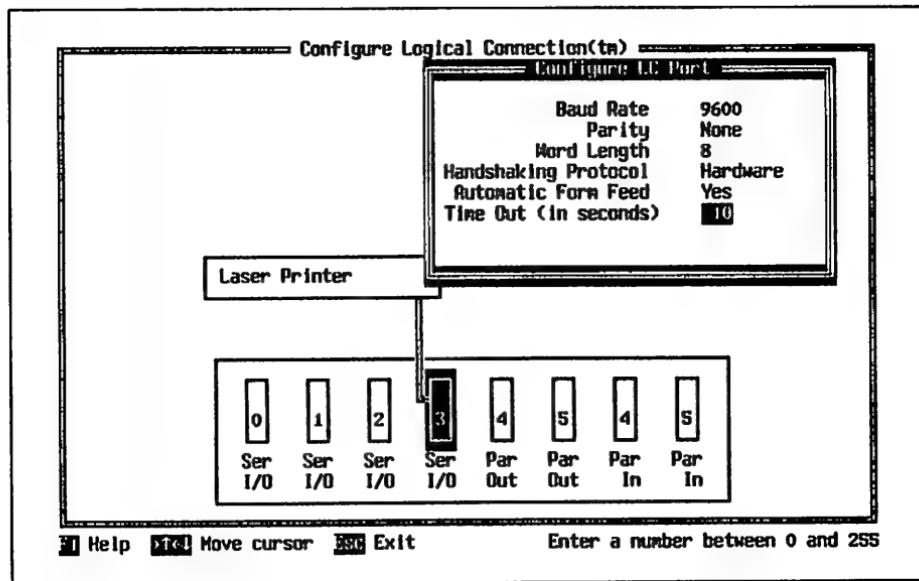
If you want to change any of these settings, just press the **↓** or **↑** keys until the light bar is on the setting you want to change. You may then type in a new value (or, for most of the fields, press the SPACEBAR to “toggle” through the range of valid choices until you reach the one you want). Since “Mary’s IBM-PC” will probably be used with these same default settings, however, so let’s leave them alone and press **Ctrl**-**→** to move to the next port. You will see the following message:

Configure Logical Connection(s)



Since you have not connected any device to the SERIAL #2 port, there is nothing there to configure, and **The Logical Connection** is just reminding you of this. If you *wanted* to add a device here, you could do so by pressing **Esc** and using the procedure outlined earlier to add the device and create a description for it. For now, just press **Ctrl** **→** to move to the next port, SERIAL #3.

Since the SERIAL #3 port is connected to a *printer* (rather than a PC), we will want to change two of the default settings. Press the  $\oplus$  key four times until the light bar is over the word "No," then press the SPACEBAR once to change it to "Yes" to provide an automatic form feed. This will insure that each document begins on a fresh sheet of paper, even if you print a report right after Mary has printed a one-paragraph memo. Then press the  $\oplus$  key once more, and type in the number "10," to allow a 10-second "Time Out" before switching printers.

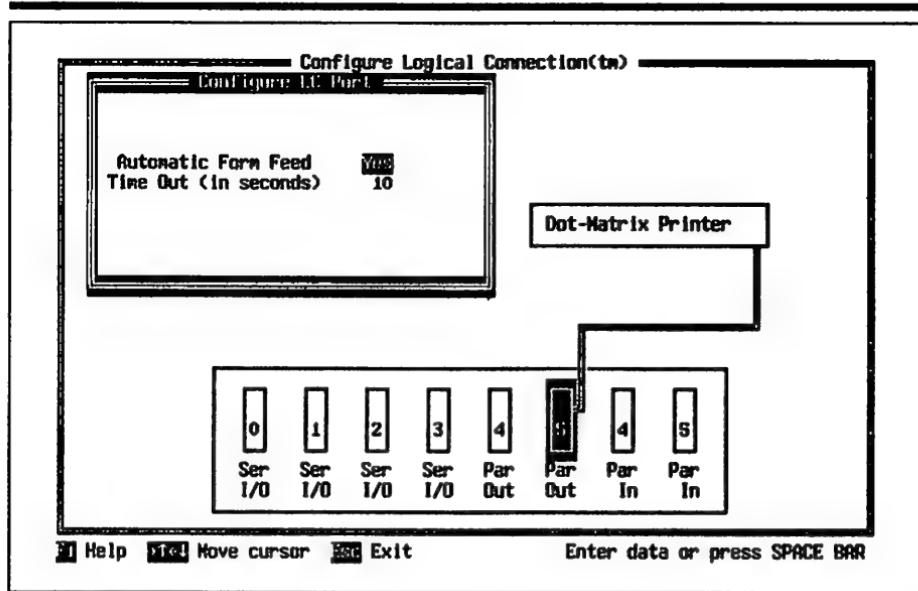


## The Parallel Ports

For parallel ports, the process is much simpler, since most of the configuration questions relate to serial interfacing.

## The Output Ports

Since we have nothing connected to the PARALLEL OUT #4 port, press  $\text{Ctrl}-\rightarrow$  twice to move the "Configure LC Port" screen to the PARALLEL OUT #5 port. You will see:



Only the **Form Feed** and **Time Out** choices have to be made. In general, you should choose **YES** to the **Form Feed** if the device is a printer, **NO** otherwise.

If your device is a computer (or any device that will not be **SHARED** by other computers), you should set the **Time Out** to 0. If it is a printer, you may choose any number of seconds up to 255. Remember, however, that if you make this a large number, **The Logical Connection** will wait a long time before switching connections. The most useful **Time Out** numbers are probably 10 to 20 seconds.

The default answers that appear here are satisfactory for the Dot-Matrix printer.

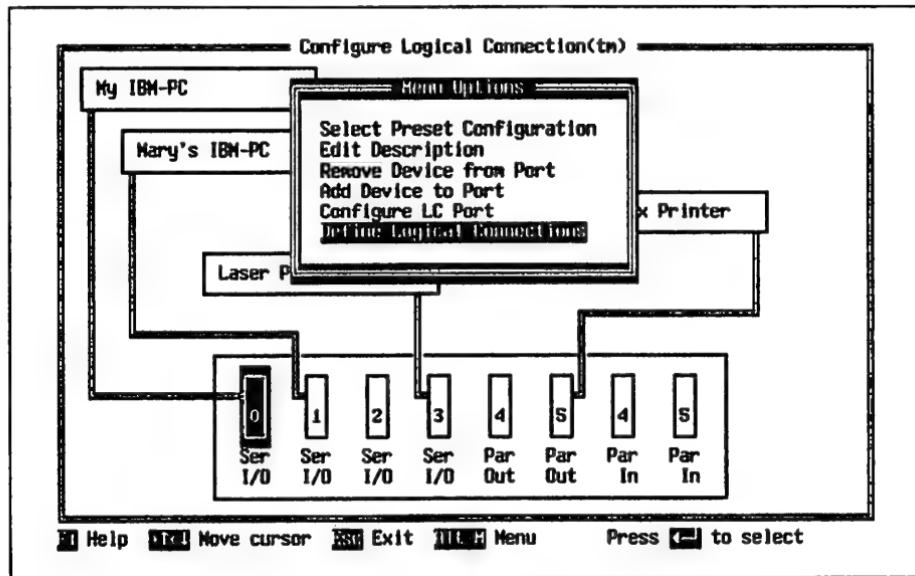
### The Input Ports

Our sample configuration has nothing connected to either of the **PARALLEL IN** ports. Even if it did, however, there would be no questions to answer, since **Form Feed** and **Time Out** refer only to printers, plotters or other **output** devices.

# Defining the Logical Connections

Now it is time to tell The Logical Connection how you want your devices “logically” connected to *each other* – how you want to “switch and share” them.

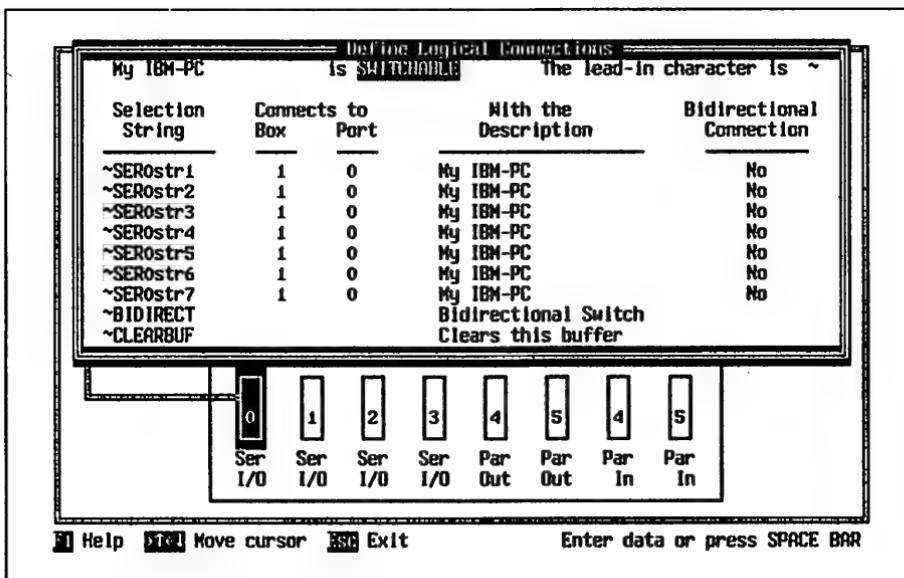
To begin, press **Esc** to exit from the “Configure LC Port” screen, then move the light bar back to the first port in use (again, SERIAL #0 in this example), and select “Define Logical Connections” from the Menu Options:



Just for practice, you might also want to try making this selection by typing **Alt-D**, bypassing the Alt-M Menu Options box.

## The Serial Ports

Either way, you'll see this screen:



It looks intimidating, but it is really not so complicated. The first thing you see is that the light bar is over the word SWITCHABLE. This means that the device connected to this port, "My IBM-PC," will be able to *switch connections* among other devices plugged into The Logical Connection. For instance, it could print a business letter on the laser printer, then switch to the Dot-Matrix printer to print out a rough draft of a lengthy document.

A FIXED connection would mean that the device would send *all* of its output to the same printer, modem or other device, just as if it were plugged directly into the other device. The only difference is, The Logical Connection will handle all the print spooling, parallel/serial conversion and other interfacing chores.

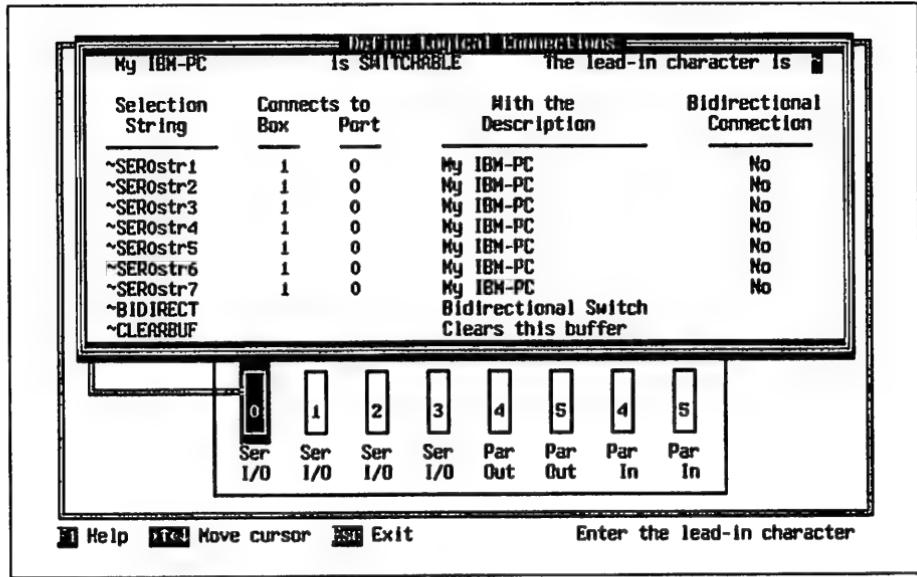
A SWITCHABLE connection is made at the device that does the switching, not the devices it is switching to.

Thus, if you want a PC to be able to SWITCH among several printers and plotters, you would make the PC SWITCHABLE. The printers and plotters would be set up as FIXED, since a printer cannot "switch" to a computer – the computer has to SWITCH to it.

In our example, we have assumed that you *do* want to be able to SWITCH among devices, so we'll leave this setting alone. Press the **→** key to move the cursor to the next field. It will say,

**The lead-in character is ~**

This character (~) is called a **tilde**.



### The lead-in character

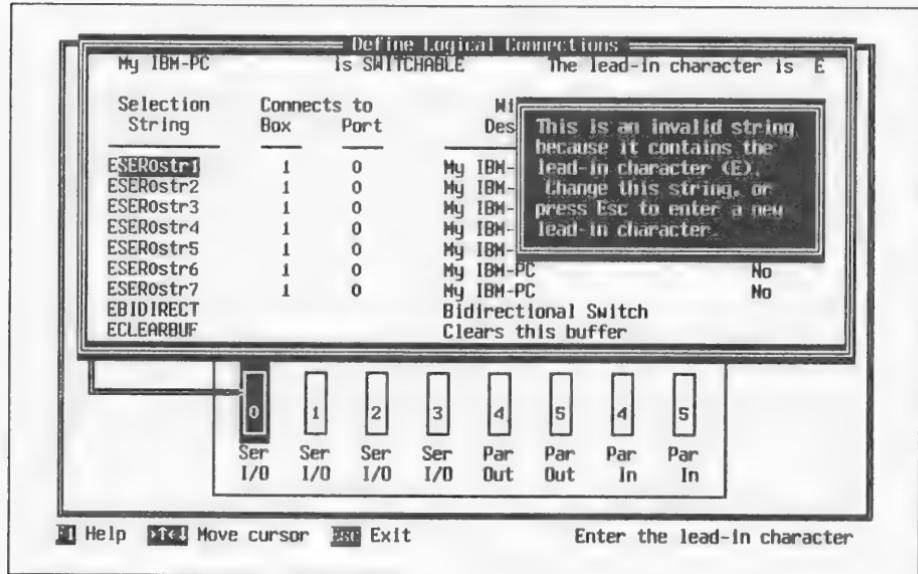
The Logical Connection uses a special 9-character code called a "selection string" as a "software switch" when it switches connections from one device to another. This selection string is composed of a special "lead-in" character followed by eight *other* characters.

(LCSETUP has already entered a list of "default" selection strings for you, which you may change if you wish.)

Whenever The Logical Connection "sees" the special "lead-in" character, it immediately checks the next 8 characters to see if they make up a selection string. If they do, it switches connections to the device you indicate on this screen!

You can switch connections by sending this selection string yourself – for example, by imbedding it at the beginning of a word processor file. With an IBM-PC or compatible, however, you don't have to worry about selection strings at all, because the POPLC program "remembers" them for you, and sends them out whenever you want. All *you* have to do is point to the device you want to switch to on a "Pop-Up" menu. (POPLC is discussed fully in the next chapter.)

Since you won't have to remember or use the selection strings yourself, the best plan is just to leave them at the default settings. If you *do* want to change them, you can. Try changing the lead-in character to "E" here, then press **←**.



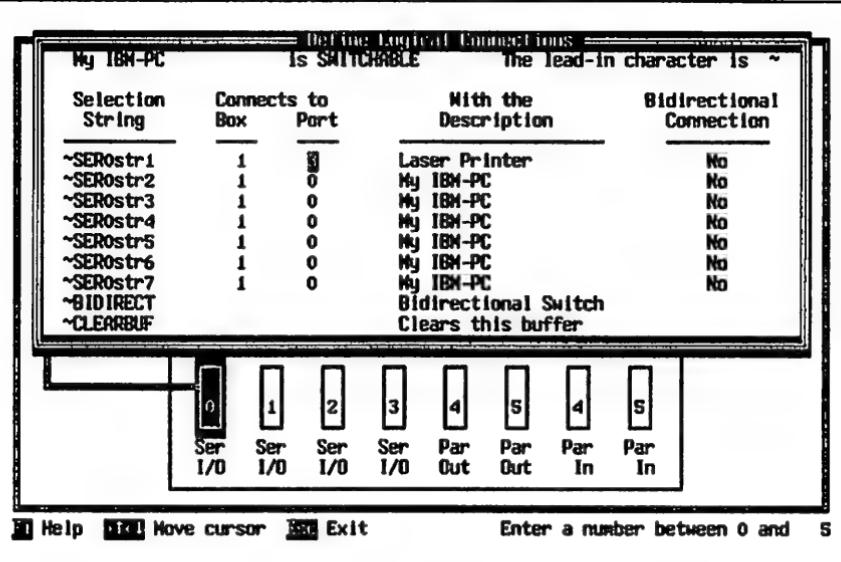
As you can see, the program changed **all** the lead-in characters simultaneously. However, it also flashed up a message telling you that you can no longer use the first default selection string. This is because a selection string may **not** contain the lead-in character. You could change the string if you wanted to, but the best bet is just to press the **Esc** key and return to the "lead-in character" line. Change it back to a ~ (tilde).

### Interactive editing

Now look at the table of connections. As you can see, all of your connections are to "Box 1, Port 0." You must *change* this listing to indicate what devices you want "My IBM-PC" to be able to switch to.

Press the **↓** **←** **→** **↑** keys to move the cursor (light bar) around the screen. You will notice that it will not move to some fields on the screen. LCSETUP keeps track of your configuration, and will not let you change something that would result in a meaningless configuration. For instance, you cannot change the "Box" number, because (in this example) this is the *only* box you are using. If you were creating a "daisy-chain" of several boxes, you would be able to change this number, and switch to devices on other boxes.

For now position the cursor on the first "0" in the "Port" column. To be able to switch to the Laser Printer (which is set up on the SERIAL #3 port), just type a "3" over the "0." You will notice that the "Description" instantly changes to "Laser Printer."



Now press the key once. The cursor will jump over the "Description" field and go to the "No" in the column titled "Bidirectional Connection". This column requires a little explanation.

### Bidirectional connections

When two devices are connected to each other, the communication may be **one-way** (where one of the devices does all of the "talking" and the other one does all of the "listening") or **two-way** (where the devices "talk" back and forth to each other). The **two-way** connections are called "**Bidirectional**."

A good example of a **one-way** connection would be a PC sending a document to be printed on a parallel printer. A good example of a **bidirectional** connection would be a PC interacting with an electronic "bulletin board" over a modem.

- A parallel connection *cannot* be bidirectional. Parallel interfaces are "**one-way**" only. (That's why The Logical Connection provides both PARALLEL OUT and PARALLEL IN ports.)

- A serial connection *can* be bidirectional and normally *should* be set up that way. Even a serial *printer*, for example, may send status codes or other information back to the computer that is sending it text to print. There are, however, exceptions to this rule.

The **Logical Connection** establishes a bidirectional connection by "capturing" the output of the serial device you are switching to. It does this by sending a separate "selection string" (you will see it on the menu with the description "**Bidirectional Switch**." In effect, this *forces* the target device to switch to *you* when you switch to *it*.

This is necessary when you *need* a two-way connection. Otherwise, you might switch connections to another PC and request a file-transfer (using a communications program), only to have the other PC send your file to the plotter that *it* was switched to before you called! On the other hand, however, it can be a real nuisance if you just need to send a message (through an electronic mail program, perhaps), but disrupt an important modem call the other PC was making by forcibly switching its output to you.

If this all sounds confusing, it *is*. Fortunately, however, there are a few basic guidelines you can follow in deciding whether to make a serial connection bidirectional:

1. Make all connections to peripherals (like printers, plotters or modems) bidirectional.
2. Make connections to another computer bidirectional if you will be using the connection interactively (like file-sharing applications or multi-user terminal emulation).
3. Do not make connections to another computer bidirectional if you do not *need* to guarantee two-way communication; especially if the other computer is using its serial port for other important applications.
4. When you may be using a connection to another computer in *both* sets of circumstances, make two separate **SWITCHABLE** connections to the same computer, one bidirectional and one not. When you need to switch connections to the computer, use the one that fits the circumstances.

After this lengthy (but necessary) digression, we are ready to return to our sample configuration. Since the Laser Printer is a peripheral device, press the **SPACEBAR** once to toggle the "**Bidirectional**" column entry to "Yes."

**Define Logical Connections**

My IBM-PC		Is SWITCHABLE		The lead-in character is ~			
Selection String	Connects to Box	Port		With the Description		Bidirectional Connection	
~SER0str1	1	3		Laser Printer		Yes	
~SER0str2	1	0		My IBM-PC		No	
~SER0str3	1	0		My IBM-PC		No	
~SER0str4	1	0		My IBM-PC		No	
~SER0str5	1	0		My IBM-PC		No	
~SER0str6	1	0		My IBM-PC		No	
~SER0str7	1	0		My IBM-PC		No	
~BIDIRECT				Bidirectional Switch			
~CLEARBUF				Clears this buffer			

Help  Move cursor  Exit      Enter data or press SPACE BAR

Now proceed down the "Port" column, entering the numbers of each device you want to be able to switch to. We'll assume that Mary's PC is close enough to yours that you can ask her to switch connections to you when you *need* a two-way dialog; so we will leave the "Bidirectional" entry for the SERIAL #1 port at "No." Your finished "Define Logical Connections" screen will look like this:

**Define Logical Connections**

My IBM-PC		Is SWITCHABLE		The lead-in character is ~			
Selection String	Connects to Box	Port		With the Description		Bidirectional Connection	
~SER0str1	1	3		Laser Printer		Yes	
~SER0str2	1	5		Dot-Matrix Printer		No	
~SER0str3	1	1		Mary's IBM-PC		No	
~SER0str4	1	0		My IBM-PC		No	
~SER0str5	1	0		My IBM-PC		No	
~SER0str6	1	0		My IBM-PC		No	
~SER0str7	1	0		My IBM-PC		No	
~BIDIRECT				Bidirectional Switch			
~CLEARBUF				Clears this buffer			

Help  Move cursor  Exit      Enter data or press SPACE BAR

When everything looks like you want it, press **Ctrl**-**→** to define the connections for port SERIAL #1:

Define Logical Connections

Mary's IBM-PC Is SWITCHABLE The lead-in character is ~

Selection String	Connects to Box	Port	With the Description	Bidirectional Connection
~SERistr1	1	1	Mary's IBM-PC	No
~SERistr2	1	1	Mary's IBM-PC	No
~SERistr3	1	1	Mary's IBM-PC	No
~SERistr4	1	1	Mary's IBM-PC	No
~SERistr5	1	1	Mary's IBM-PC	No
~SERistr6	1	1	Mary's IBM-PC	No
~SERistr7	1	1	Mary's IBM-PC	No
~BIDIRECT			Bidirectional Switch	
~CLEARBUF			Clears this buffer	

0 1 2 3 4 5 4 5  
Ser 1/0 Ser 1/0 Ser 1/0 Ser 1/0 Par Out Par Out Par In Par In

Help → Move cursor Esc Exit Enter data or press SPACE BAR

Enter the connections for "Mary's IBM-PC" the same way you did yours, giving *her* access to both printers and your PC:

Define Logical Connections

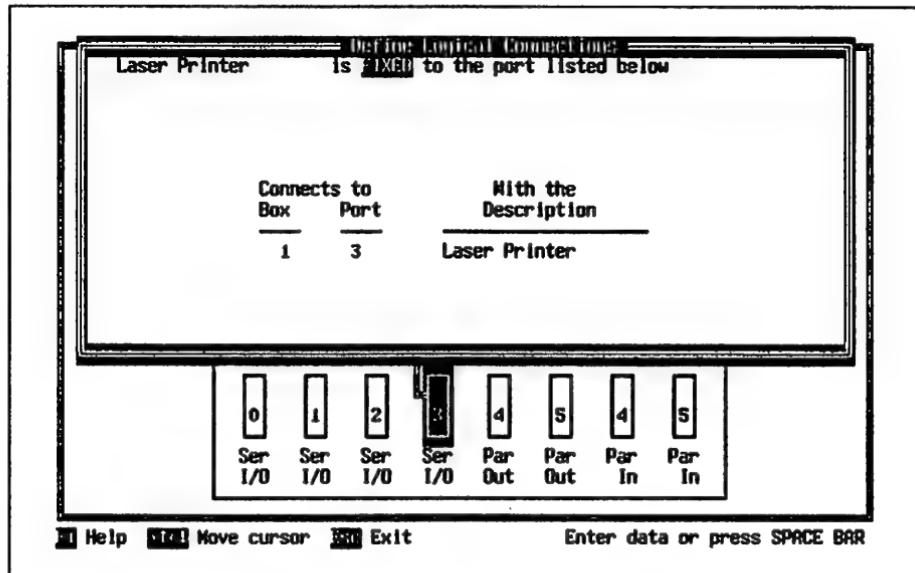
Mary's IBM-PC Is SWITCHABLE The lead-in character is ~

Selection String	Connects to Box	Port	With the Description	Bidirectional Connection
~SERistr1	1	5	Dot-Matrix Printer	No
~SERistr2	1	3	Laser Printer	Yes
~SERistr3	1	2	My IBM-PC	No
~SERistr4	1	1	Mary's IBM-PC	No
~SERistr5	1	1	Mary's IBM-PC	No
~SERistr6	1	1	Mary's IBM-PC	No
~SERistr7	1	1	Mary's IBM-PC	No
~BIDIRECT			Bidirectional Switch	
~CLEARBUF			Clears this buffer	

0 1 2 3 4 5 4 5  
Ser 1/0 Ser 1/0 Ser 1/0 Ser 1/0 Par Out Par Out Par In Par In

Help → Move cursor Esc Exit Enter a number between 0 and 5

When you are satisfied with the connections for this port, skip over the unused SERIAL #2 port by pressing **Ctrl**-**→** twice. Press the SPACEBAR to toggle the SWITCHABLE field to FIXED, and leave the Laser Printer "connected" to itself. (Since you will be switching to it with a bidirectional connection, you will capture its feedback when you need it; at other times, leaving it connected to itself will guarantee that any stray signals it might happen to emit do not accidentally interfere with someone else's data stream:



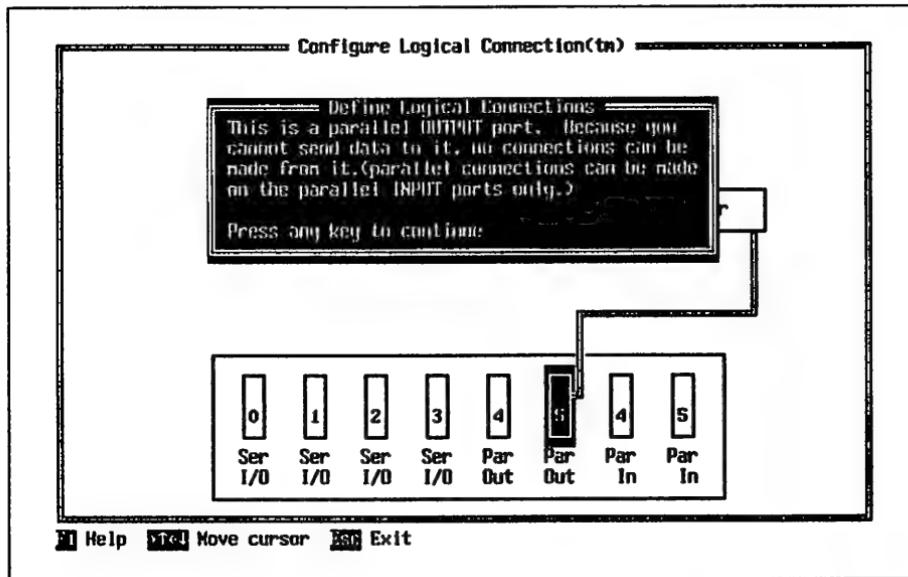
## The Parallel Ports

We are nearing the end of our configuration process, and have only one remaining device to consider: the Dot-Matrix printer connected to the PARALLEL OUT #5 port.

Press **Ctrl**-**→** twice to move the "Define Logical Connections" screen to port PARALLEL OUT #5.

## The Output Ports

When you try to define connections from a PARALLEL OUT port in this way, the LCSETUP program reminds you that you can't do it:



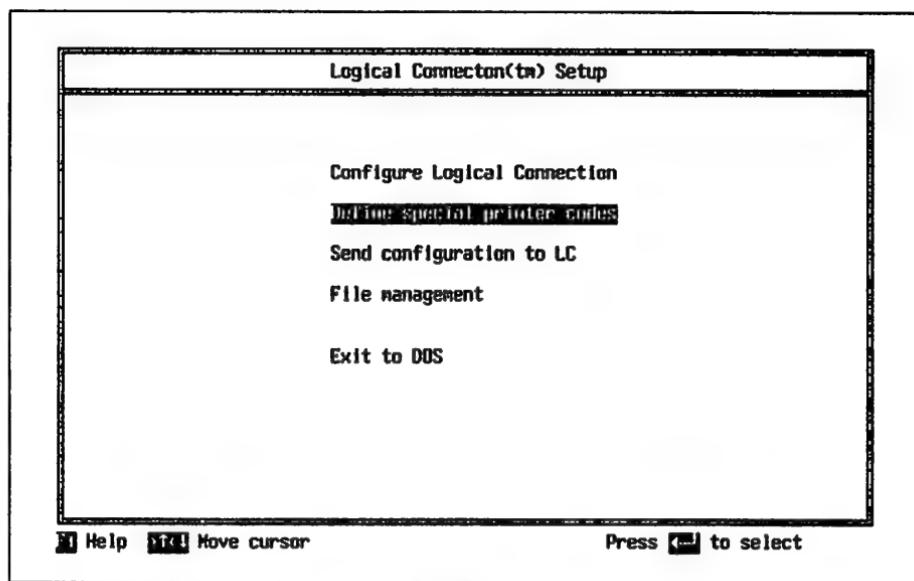
Since data goes OUT from **The Logical Connection** to the printer (or other device) connected to this port, there would be no way for the device to send a selection string to **The Logical Connection**. A *printer* can't "switch" connections!

## The Input Ports

Defining the connections for the PARALLEL IN ports is almost identical to the process for SERIAL ports. In fact, the only difference is the absence of the **Bidirectional Connection** option (since parallel communications can *only* go one-way).

We do not have any PARALLEL IN devices in our sample configuration, so it is time now to exit the "Define Logical Connections" screen by pressing the **Esc** key.

# Defining special printer codes



Your configuration is now complete. Before sending it to **The Logical Connection** and leaving the LCSETUP program, however, you may wish to define special printer "control codes" that you can send to any of your printers or other devices.

Many printers and plotters can accept certain "control codes" (usually including certain "unprintable" characters like the <ESCAPE> character) to perform various setup functions. Some applications programs provide a function that will allow you to send such control codes to your printer when you print a document.

The memory-resident POPLC program that you will use to instantly switch from one printer to another, also provides a way of sending printer control codes whenever you want, to *any* device you can switch to. You do not have to print a document to send these codes, and it does not matter what program, if any, you are using at the time.

If you want to be able to send such printer codes, press the **↓** key once to select "Define special printer codes," and press **↵**. You will see the following screen:

Define special printer codes

Description

Printer Code

First printer codes

second printer codes

third printer codes

fourth printer codes

 Help  Move cursor  Exit

Enter the description

You may enter up to four special printer codes here. For each code you should type in a *description* of the function that the code will perform. It is this description that you will see when you "pop-up" the POPLC switching menu.

For our example, let's assume that you want to be able to "reset" your laser printer (return it to its default settings, clear its buffer and eject any unprinted pages). The control code to do this is "<ESCAPE> E."

## Entering a description

Define special printer codes

Description	Printer Code
Reset laser printer	
second printer codes	
third printer codes	
fourth printer codes	

Enter the description

With the light bar over “first printer codes”, type in the description “Reset laser printer.” As soon as you begin typing, [brackets] will appear around the field and you will have access to the editing commands listed earlier.

## Entering a code

When your description is correct, press and the light bar will move to the blank “Printer Code” column. As with the “Description” column, you will automatically be placed in edit mode when you begin typing. Just enter code or codes, up to the full length of the light bar.

## Non-printing characters

Define special printer codes	
Description	Printer Code
Reset laser printer	\027E
second printer codes	
third printer codes	
fourth printer codes	

As you can see, the "<ESCAPE> E" code was entered as "\027 E." You cannot enter the <ESCAPE> character directly, because it is a non-printing character. If you were to try typing it in by pressing the **Esc** on your keyboard, LCSETUP will take it as a command to exit from the screen, and you will find yourself back at the main menu!

To get around this difficulty, there are different ways of representing such characters. LCSETUP uses the same method as 1-2-3 and many other programs: non-printable characters (like <ESCAPE>) can be indicated by the 3-digit decimal equivalent of the character's ASCII code, preceded by a backslash (\) character. The ASCII code for the <ESCAPE> character is **00011011**, whose decimal equivalent is 27.

To use this representation, you *must* use *three digits* after the backslash. If you tried entering the code as "\27E," you would get the following message when you pressed the **[→]** key:

Define special printer codes

Description	Printer Code
Reset laser printer	N27E
second print	
third print	
fourth print	

This printer codes is invalid because  
of an incorrect format of the "nnnn" code.  
Either press the ESC key to return the code  
to its previous state, or press any other key  
to correct this printer code.

Help Move cursor Esc Exit

Enter the description

You may enter as many codes as you wish on each line, and they will all be sent together to the printer whenever you select the line's description when it appears on the POPLC menu.

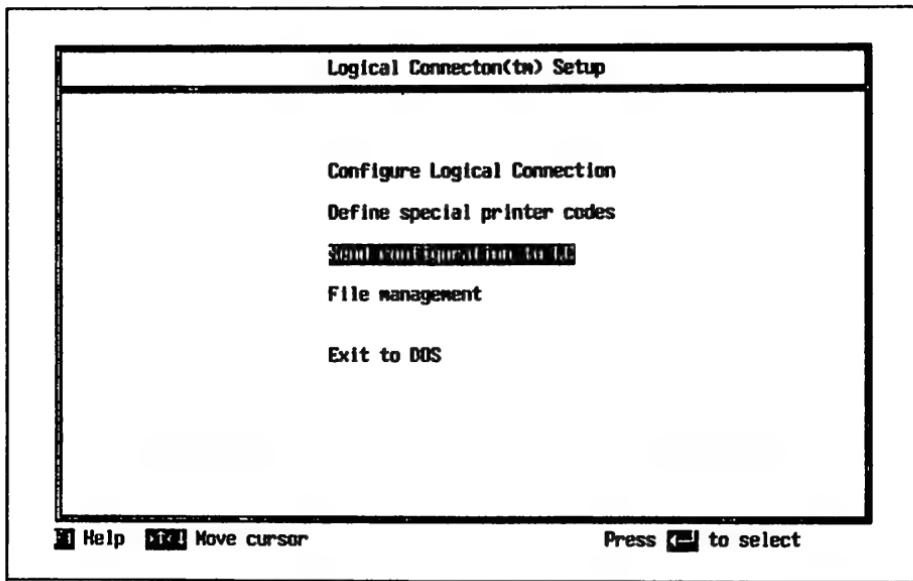
If you have additional codes, you can enter them on the remaining three lines of the screen in the same way, giving each one a recognizable description. Remember, you can send any of these strings to any of your printers, plotters or other peripherals; so you may want to define special codes for more than one device.

When you have entered all the codes you need, press **Esc** to return to the main menu.

# Sending your setup to The Logical Connection.

Before you can use the configuration you have just completed, you must "save" it in The Logical Connection's battery-protected RAM (Random Access Memory). You may also (or *instead*, if you are creating an alternate configuration or configuring a different Logical Connection) want to save it to a special file for future use.

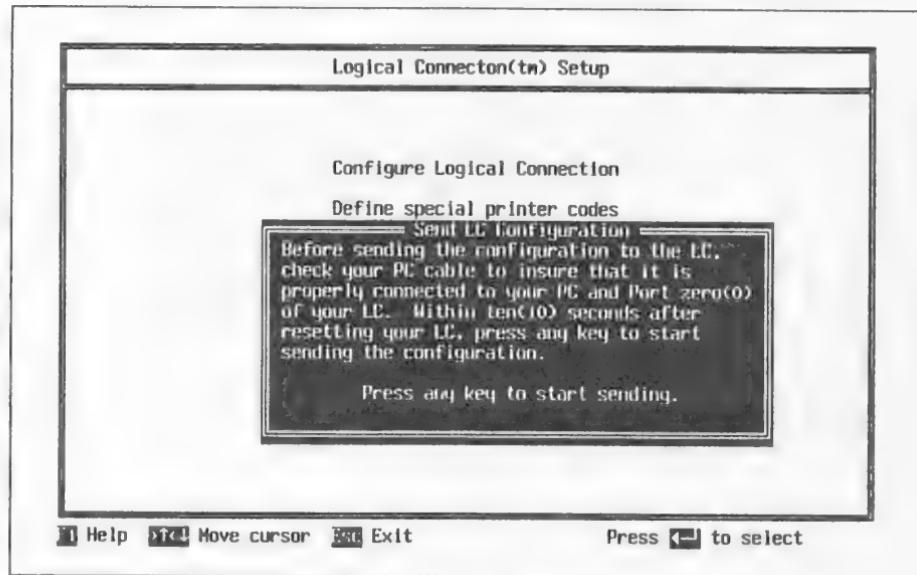
## Getting The Logical Connection ready



Before you can save the setup you have selected, you must make sure that The Logical Connection is properly connected and powered up. Remember:

- One end of the PC Serial Cable is plugged into your PC's COM1 serial port.
- The other end is plugged into The Logical Connection's SERIAL #0 port.
- The little plug at the end of the transformer cord is plugged into the 3-prong socket at the right edge of The Logical Connection.
- The power transformer is plugged into a standard 110-120V electrical wall outlet.

When you are satisfied that everything is connected properly, choose "Send configuration to LC" on the menu (by pushing the **+** key once) and press **→** to select it. You'll see the following message:



The configuration you have selected will actually be stored in battery-backed RAM inside **The Logical Connection**, so it will "remember" how you have everything set up even if you leave it unplugged for a long time. To avoid the chance of *accidentally* altering what is stored there, the RAM can only be accessed in the first few seconds after **The Logical Connection** is **RESET**.

That is why it is important to follow the instructions on this screen carefully, and in exactly this order:

1. **FIRST**, press the **RESET** button on the left edge of **The Logical Connection**. You will know it has been reset by the fact that the **STATUS LED** will turn **ON**, and the **RUN LED** will begin to **FLASH** rapidly. Then,
2. **WITHIN TEN SECONDS**, press the **→** key (or *any* key on your PC's keyboard) to start sending your configuration to **The Logical Connection**.

The last line in your "Send LC Configuration" screen will change to "Starting communications with the LC," then "Established connection," and "Sending configuration."

## Logical Connecton(tm) Setup

### Configure Logical Connection

#### Define special printer codes

Send LC Configuration

Before sending the configuration to the LC, check your PC cable to insure that it is properly connected to your PC and Port zero(0) of your LC. Within ten(10) seconds after resetting your LC, press any key to start sending the configuration.

\*\* Established connection. \*\*  
\*\* Sending configuration. \*\*

Help  Move cursor Esc Exit

Press  to select

When the configuration has been sent, the menu box will vanish, returning you to the main menu.

If the program could *not* communicate with The Logical Connection, you would have seen this screen:

## Logical Connecton(tm) Setup

### Configure Logical Connection

#### Define special printer codes

Did not establish communication with the LC.

Press any key to continue.

Help  Move cursor Esc Exit

Press  to select

If this happens, check your cable, transformer and LED's to make sure

everything is set up properly, then try again. Remember to start sending the configuration *within ten seconds* of pressing the **RESET** button.

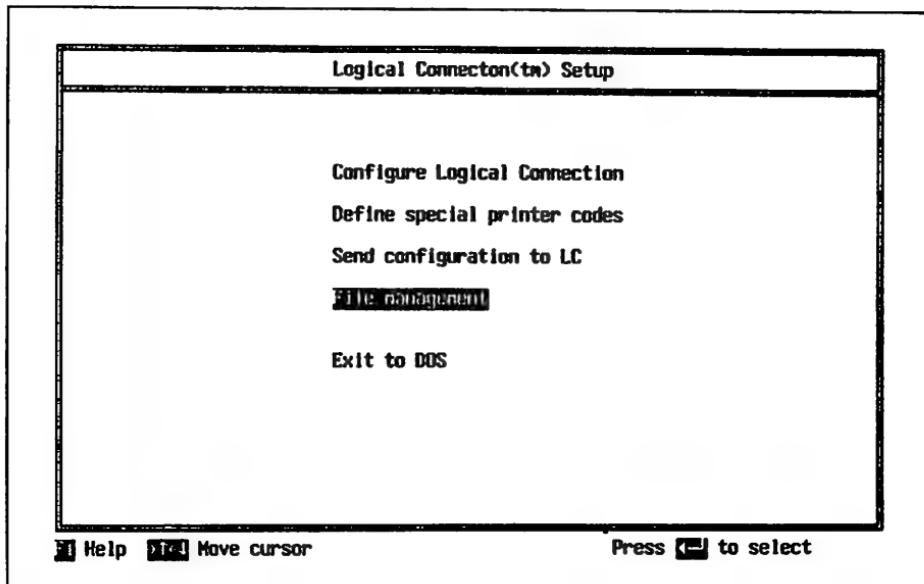
After you configuration has successfully been sent to **The Logical Connection**, move the light bar to the last item on the main menu, "Exit to DOS," and press **←**.

It is now safe to unplug **The Logical Connection** if you wish. Your configuration will not be lost.

## LCSETUP file operations

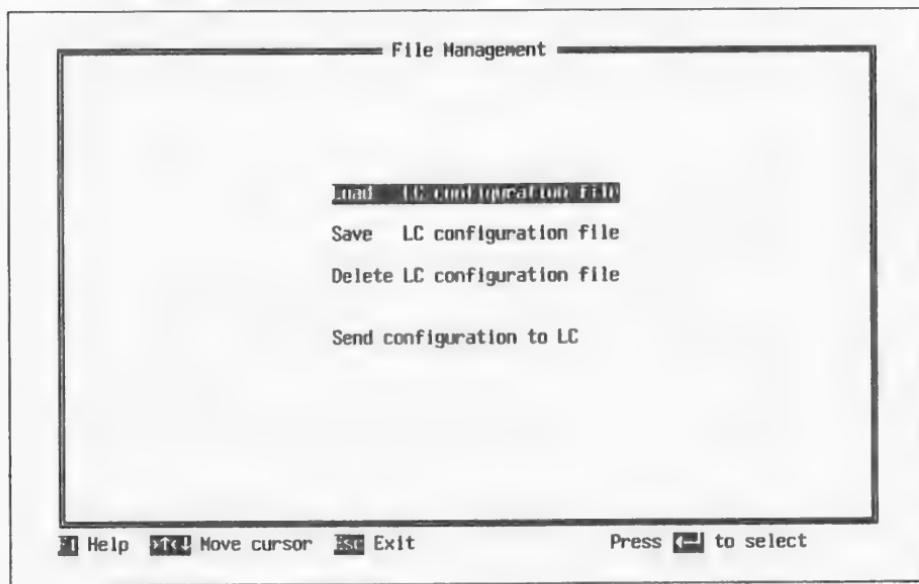
When you sent your configuration to **The Logical Connection**, the LCSETUP program automatically wrote it into a special file called **CONFIG.LC**. This file was written onto the same directory the LCSETUP program was run from (which *should* be either the **\LC** directory on your hard disk or a copy of the **Utility Program Disk** in your **A: drive**).

You may wish to create another file to save it in, however. That way, you can create *several* configurations, and load any one of them into **The Logical Connection** whenever you like. To do this, choose the third option from the main menu, "File Management":

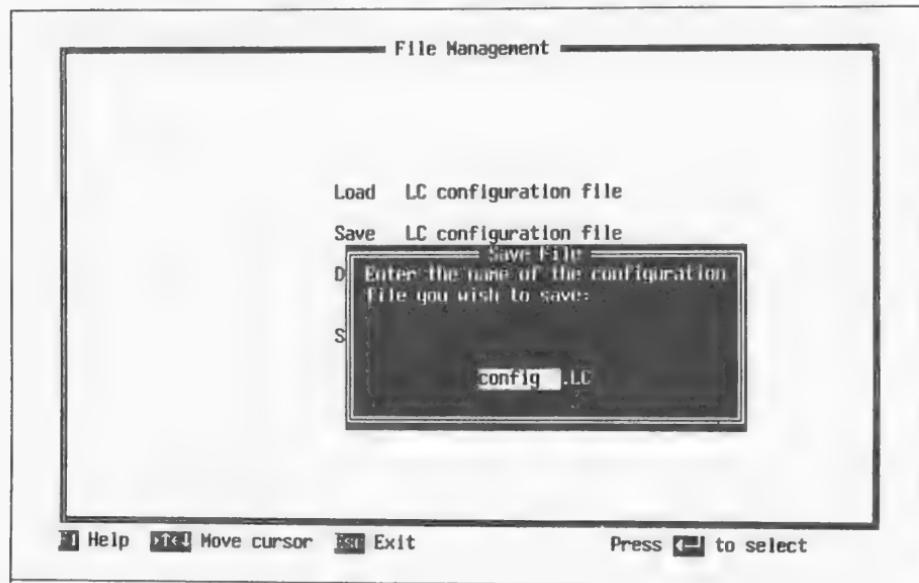


## Saving a configuration file

When you press **←**, the File Management screen will appear:



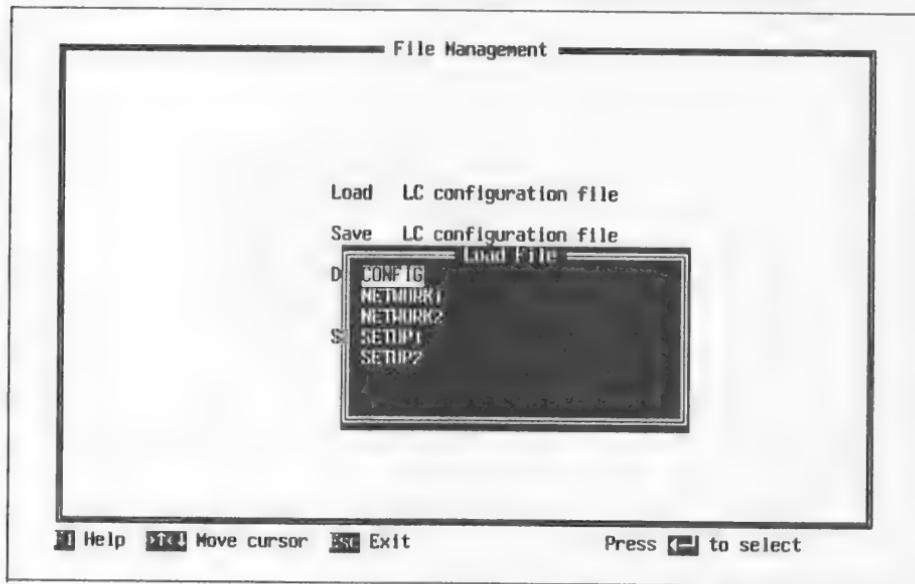
Choose the second option, "Save LC Configuration File", and press **←**. A little window will pop up, asking you for a file name:



Just type any name you will remember (up to 8 characters), and press **←**. LCSETUP will write the configuration you have just made to a file with your filename and the **.LC** extension.

### Loading a configuration file

You can reload this file (or *any* **.LC** file you have created by choosing “Load LC Configuration File.” The following window will appear:

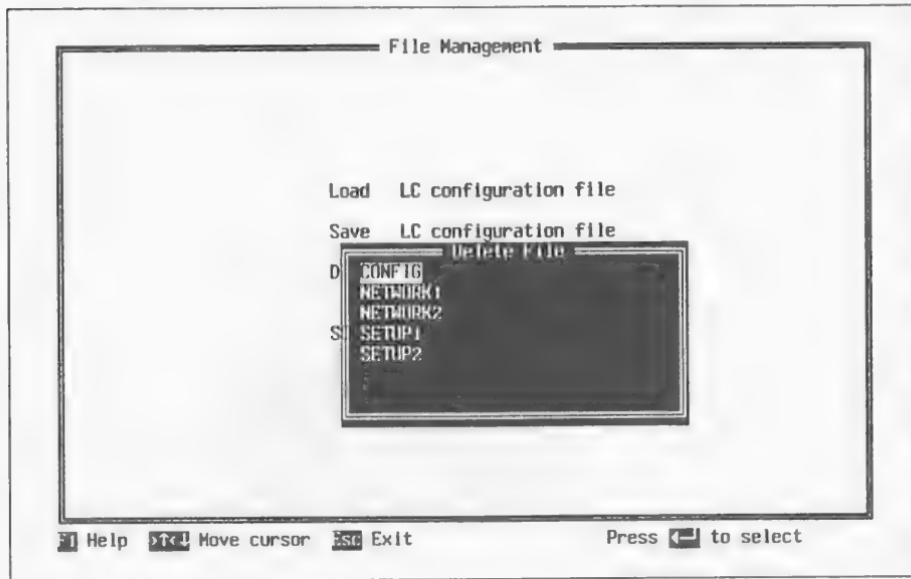


Just scroll down the list of filenames, using the arrow keys, until the file you want to load is highlighted (the **.LC** extension will not appear in the window).

When you press return, it will be loaded into LCSETUP and you will be returned to the **File Management** menu. If you now press the **Esc** to “ESCAPE” from this menu back to the Main Menu and choose “Configure Logical Connection,” your newly-loaded configuration will be displayed, and you may modify it if you wish. Or, you can “download” it immediately by choosing “Send configuration to LC.”

## Deleting a configuration file

The final option on the **File Management** menu is self-explanatory. When you choose “Delete LC Configuration File” you’ll scroll through the filenames in this window:



When you press **[Delete]**, your file will be gone for good, so be careful!

## Exiting the LCSETUP program

When you've finished your session with LCSETUP, simply press the **[Esc]** key until you are back at the main menu, then choose the last item on the list, “Exit to DOS,” and press **[Delete]**.

# Chapter 6

## Using the Logical Connection

In this chapter you will learn:

- How to find the right cables and connect your computers, printers & other peripherals to **The Logical Connection**.
- How to use the memory-resident POPLC program to switch connections for you, instantly.

Congratulations! If you have made it this far, you have finished setting up **The Logical Connection** and are ready to start using it. This is the easy part.

### Connecting the cables

There are three simple rules for finding and connecting the right cables:

1. To connect a printer, plotter or any other device to **The Logical Connection** – serial *or* parallel – use the same cable you would use to connect the same device to an IBM-PC. (If your devices are presently connected to a PC or compatible, all you have to do is unplug them from the computer and plug them into **The Logical Connection**).
2. To connect your PC or compatible's *serial* port (COM1 or COM2) to **The Logical Connection**, use the special red PC Cable that came with this package. (If you are hooking up more than one PC, you may order additional cables from Fifth Generation Systems for a nominal fee – call the TOLL FREE number listed in the rear of this manual.)

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3. To connect your PC or compatible's *parallel* port (LPT1 or LPT2) to **The Logical Connection**, use a *straight-through 25-pin* parallel cable with a male DB-25 connector on the end that plugs into the PC's LPT1 or LPT2 port, and a female DB-25 connector on the end that plugs into **The Logical Connection's** PARALLEL IN port. You may order this cable from Fifth Generation Systems for a nominal fee.

## Non-compatible computers

Even though you configured your **Logical Connection** on an IBM-PC or compatible, you may still have another kind of computer that you want to hook up, too. If so, finding the right cable can be a little trickier.

Beyond the IBM "standard", there are so many different kind of port configurations, connectors, pin assignments and cabling specifications that there just aren't any simple rules.

If you have a computer that uses port configurations that are different from the IBM-PC, Appendix A contains an in-depth discussion and diagrams that should help you make the right choice.

## The POPLC program

When the LCSETUP program sent your configuration to **The Logical Connection**, it also created a special file in your \LC directory (or on your copy of Utility Program Disk if you did not install the programs on a hard disk) named CONFIG.LC. This file contains all of the configuration information, including the "selection strings" that will tell **The Logical Connection** to switch your computer's output from one printer to another.

Another program, POPLC.EXE, is also on the Utility Program Disk (and \LC directory). POPLC is a *memory-resident* program which reads the config.lc file and switches connections for you.

## Copying the \LC programs

Since *each* PC that is plugged into The Logical Connection will need its own copy of the POPLC.EXE program and the CONFIG.LC configuration file, you must make copies of these files and install them on each PC's hard disk. To do this, place an empty, formatted diskette in your PC's A: drive, then type:

```
C: [H]  
CD \LC [H]  
COPY POPLC.EXE A: [H]  
COPY CONFIG.LC A: [H]
```

When the files have been copied, remove the diskette from your A: drive and insert it into the A: drive of another PC that is plugged into The Logical Connection. Type (on the other PC):

```
C: [H]  
MD \LC [H]  
CD \LC [H]  
COPY A: POPLC.EXE [H]  
COPY A: CONFIG.LC [H]
```

You may then remove the diskette from the PC's A: drive. Repeat this procedure for *each* PC in your setup.

If any of your PC's are not equipped with hard disks, you must provide them with the floppy diskette copy of these two programs, which they can use to load POPLC.

## Loading POPLC

POPLC is *memory-resident*, which simply means that once you "load" it into your computer's memory, it *stays* there even when it is not being used. The advantage of this is that it is always available instantly, *even when you are in the middle of another program*. So if you want to print a LOTUS 1-2-3 graphics chart on a dot-matrix printer, then switch to a letter-quality printer for a worksheet summary, you don't ever have to leave 1-2-3 to do it.

**NOTE - If you are using POPLC along with other memory-resident programs, read the documentation for the other programs carefully to see if they must be loaded after POPLC.**

---

To load POPLC from your hard disk, type:

CD \LC   
POPLC [OPTIONS] 

## Options

There are four optional settings you can make when loading POPLC.

These are:

**LC=[LC port]**

where *LC port* is the number of the Logical Connection port into which your PC is plugged.

**PC=[PC port]**

where *PC port* is the PC port (COM1, COM2, LPT1 or LPT2) which is plugged into The Logical Connection.

**C=[Color code]**

where *Color code* is one of the following color settings:

B or 1	for	blue
G or 2	for	green
3	for	cyan
R or 4	for	red
M or 5	for	magenta
6	for	brown
7 or 0	for	black

If you do not specify a color setting on the command line, the display will be black and white. (Of course, you cannot specify a color if you are using a monochrome monitor).

**I=[Invocation key]**

where *Invocation key* is a keycode in the range 15-132. (For a list of keycodes, see the "Table of Invocation Keys" at the end of this chapter.) This option is provided to avoid conflicts in case the special key sequence you will use to call up POPLC (**Alt**-**L**) has a different function in any other program you may be using. If you set this option, POPLC will be called by the new Invocation key you specify, instead of **Alt**-**L**.

## Example

As an example, if your PC's COM1 port is plugged into The Logical Connection's SERIAL #0 port, you would load POPLC by typing:

**POPLC PC=COM1 LC=0** 

If you had color or invocation key options, you would put them on the same line, separated by a single blank space. The order in which you type the options does not matter.

If you will be using POPLC regularly, you may want to insert this line in your AUTOEXEC.BAT file, so that POPLC will automatically be loaded each time you start up your PC. (See your DOS manual if you need to learn what an AUTOEXEC.BAT file is, and how it is used).

**REMEMBER, if your PC-to-Logical Connection link is serial, you will probably have to set your COM1 or COM2 parameters and re-route your printer output from LPT1 (the normal default) to COM1 or COM2 with DOS "MODE" commands something like this:**

**MODE COM1:9600,n,8,1**   
**MODE LPT1:=COM1:** 

**You might also want to include these commands in your AUTOEXEC.BAT file. See your DOS manual for complete details on the MODE command and AUTOEXEC.BAT.**

To load POPLC from your Utility Program Disk, put the disk in your PC's a: drive and type:

**A: **  
**POPLC LC=[OPTIONS]** 

You will immediately see the following screen:

```
C>poplc lc=0 pc=com1
```

Pop-Up  
Pop-Up Logical Connection v1.5

Copyright 1987, Fifth Generation Systems, Inc.

Portions of this product are  
Copyright 1985 Popular Programs, Inc.

Press ALT-L for Logical Connection.

```
C>
```

This means that POPLC is loaded. You may use it now, or just leave it in memory until you need it. It will stay loaded until you turn off your PC (or reset it).

## Switching connections

Using POPLC to switch connections is just as easy. Whenever you want to make a switch, just press **Alt-L**. Up pops a little window with the names of your devices. If you installed the example configuration from Chapter 5, for instance, this window would pop up:

LaserPlus Snapshot Utility Version 1.2.2  
Copyright 1986 Northern Software Limited

Would you like instructions? n

Do you want to inst

The snapshot routine

c>

#	Description	Box	Port	F1 Help	F2 View	F3 FormFeed	F4 Codes
1	Laser Printer	1	3	F2 View			
2	Dot-Matrix Printer	1	5		F3 FF		
3	Monochrome PC	1	1			F4 CC	
4	Hi 10M PC	1	0				
5	Hi 10M PC	1	0				
6	Hi 10M PC	1	0				
7	Hi 10M PC	1	0				

Clear current LC port buffer.

PC Port COM1 connects to LC Port 0

F1 Help F2 View F3 FormFeed F4 Codes

You will notice that the light bar is on the first line, "Laser Printer," and that there is a little triangle in the column to the left. The triangle indicates what device is currently selected. (The first line is your "default" selection – if The Logical Connection receives no switching instructions it will connect to this device automatically.)

To switch connections, first use the  key to move the light bar over the device you want to switch to. For example:

#	Description	Box	Port	F1 Help
1	Laser Printer	1	3	F2 View
2	Dot Matrix Printer	1	5	F3 FF
3	Mary's IBM-PC	1	1	F4 CC
4	Mg IBM-PC	1	0	
5	Mg IBM-PC	1	0	
6	Mg IBM-PC	1	0	
7	Mg IBM-PC	1	0	

Clear current LC port buffer.

PC Port COM1 connects to LC Port 0

F1 Help F2 View F3 FormFeed F4 Codes

If you now press , you will have switched connections to "Mary's IBM-PC." From now on (until you "pop up" the program and switch connections again) everything you "print" will go to Mary's PC instead of the Laser Printer. (Remember that you will need a communications program or file-sharing utility if you want to send and receive data from another PC. For printers and other peripherals, you do not need any special software.)

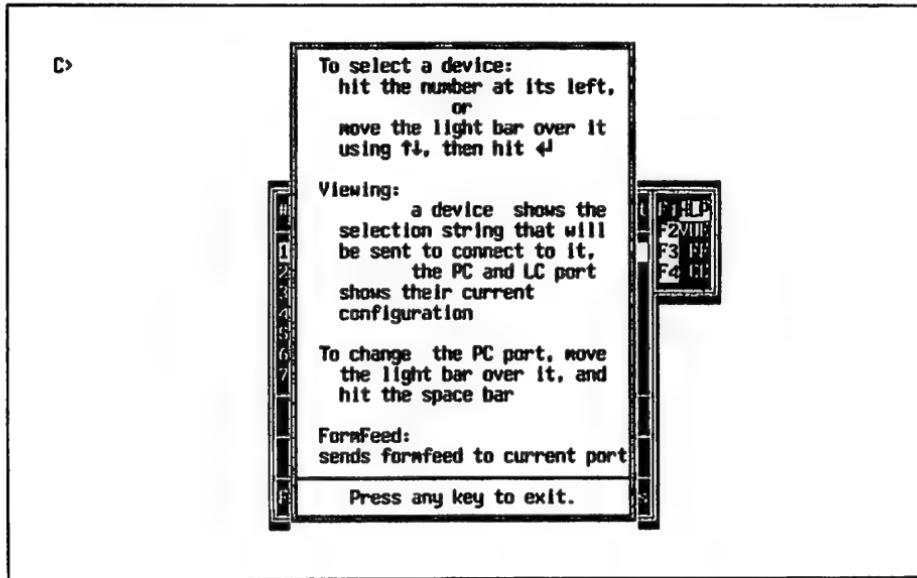
**NOTE – The first device listed on the POPLC menu (which is also the first device you listed on your "Define Logical Connections" screen in the LCSETUP program) is the "default" connection for your PC. If The Logical Connection is unplugged or RESET, it will automatically connect your PC to this device when it first come back to operation. If this happens, POPLC won't know about it, and may indicate that you are still connected to another device. To be sure, call POPLC and "switch" to the device you want when you first turn on your equipment in the morning, or any time normal operation is disrupted.**

## Special functions

In the upper right corner of the POPLC "window," you will see a legend indicating some special functions you can access by pressing the **FUNCTION** keys **F1**, **F2**, **F3** and **F4**.

## Help

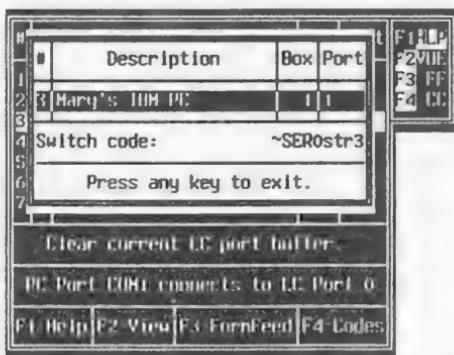
When you press the **F1** key, a "HELP" screen will appear, containing brief instructions for using the POPLC function that is *currently highlighted*:



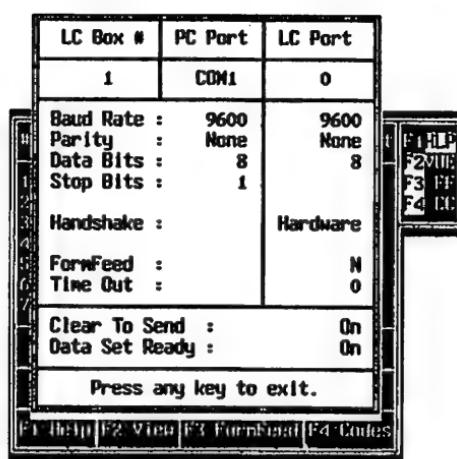
## Viewing additional information

When you press the **F2** key, a smaller window will open, showing the "switch code," (selection strings) that POPLC will send to SWITCH to this device:

C>



You may also view the configuration parameters for your Logical Connection port and the PC port it is connected to by highlighting the last line on the window and pressing **[F2]**. You'll see a screen like this:



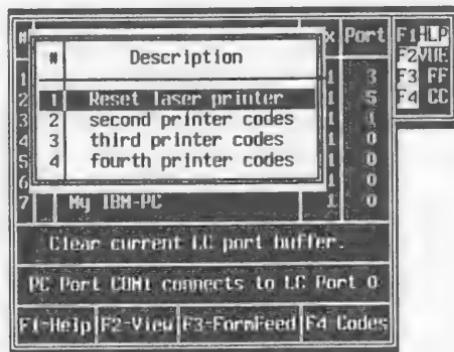
## Form Feed

If you want to send a "Form Feed" to one of your devices (*without* necessarily switching connections to it), you may do so by pressing the **[F]** key while that device is highlighted. This is a useful feature to make sure that all previous documents are "flushed" from a printer, before you begin printing on it. You may use this key whether or not the device is configured to provide an automatic Form Feed.

## Control Codes

The **F4** key allows you to send one of the special "Printer control codes" you had an opportunity to define while using the LCSETUP program. When you press **F4**, you'll see this screen, listing each code's description:

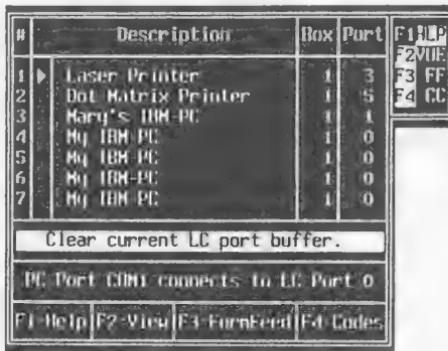
C>



To send a code to the device that is *currently selected*, just position the light bar over the code you want to send and press **↵**. To exit from this screen *without* sending a code, press **Esc**.

## Clearing the buffer

C>



Another feature provided by POPLC is the ability to clear **The Logical Connection**'s buffer of any data you have sent it. This can be useful if your printer jams or runs out of paper in the middle of a print job, for example, and you want to start printing again from scratch after you have corrected the problem. Just move the light bar over "Clear current LC port buffer," and press **Spacebar**.

Please note that this function only clears the buffer of data received on *this* LC port (the one you specified with the **LC=[LC Port]** option). If another PC is sending data to a printer, it will not be affected.

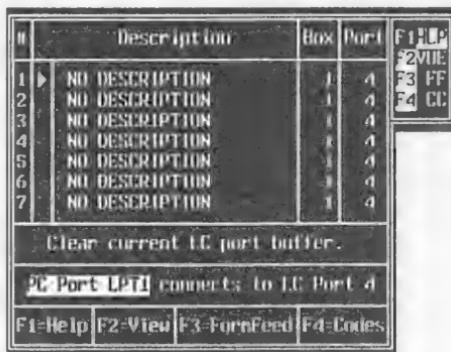
## Changing the PC and LC ports

C>



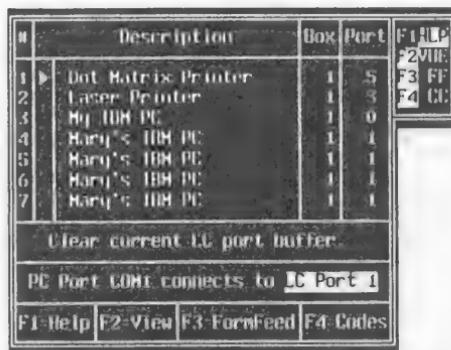
The second-to-last line on the menu displays the PC and LC ports you specified when you loaded POPLC. (If you did not specify these ports, the program "defaults" to **PC=COM1 LC=0**.) You can change these settings by positioning the light bar over the setting you want to change, and pressing the **SPACEBAR** to "toggle" through the possible choices.

POPLC "checks" your PC and your LC configuration, and will not allow you to select a choice that does not exist. For example, if you have just one serial port and one parallel port, pressing the **SPACEBAR** here will toggle you back and forth through COM1 and LPT1. If you had other ports, it would toggle through them, too.



When you toggle from COM1 to LPT1, notice that the setting for "LC Port" automatically changes from 0 to 4 at the same time. This is because you cannot plug a parallel port into The Logical Connection's SERIAL #0 port. POPLC defaults to the first available parallel port (this would be PARALLEL IN #4).

Similarly, if you press the **→** key once to move to the "LC Port" field and toggle it from 4 to 1, the "PC Port" setting changes back to COM1:



## Exiting POPLC

When you press the **[→]** key to instruct POPLC to switch connections for you, the POPLC window will disappear from your screen, and you will be wherever you were when you first invoked it. If you were in the middle of another program, such as a word processor or spreadsheet, you will still be there. You don't have to do anything else – just continue working, but any documents you now print will be automatically re-routed to your new printer choice.

If you don't want to switch connections, you may leave POPLC by pressing the **[Esc]** key. POPLC will remain loaded in your computer's memory and ready to use again at any time, until you turn off your PC or re-boot it. At that time, you will have to re-load it (or have your AUTOEXEC.BAT file automatically re-load it for you).

# Table of Invocation Keys

Code	Invocation Key
15	<b>Alt</b> - <b>(Shift - →)</b>
16	<b>Alt</b> - <b>Q</b>
17	<b>Alt</b> - <b>W</b>
18	<b>Alt</b> - <b>E</b>
19	<b>Alt</b> - <b>R</b>
20	<b>Alt</b> - <b>T</b>
21	<b>Alt</b> - <b>V</b>
22	<b>Alt</b> - <b>U</b>
23	<b>Alt</b> - <b>I</b>
24	<b>Alt</b> - <b>O</b>
25	<b>Alt</b> - <b>P</b>
30	<b>Alt</b> - <b>A</b>
31	<b>Alt</b> - <b>S</b>
32	<b>Alt</b> - <b>D</b>
33	<b>Alt</b> - <b>F</b>
34	<b>Alt</b> - <b>G</b>
35	<b>Alt</b> - <b>H</b>
36	<b>Alt</b> - <b>J</b>
37	<b>Alt</b> - <b>K</b>
38	<b>Alt</b> - <b>L</b>
44	<b>Alt</b> - <b>Z</b>
45	<b>Alt</b> - <b>X</b>
46	<b>Alt</b> - <b>C</b>
47	<b>Alt</b> - <b>V</b>
48	<b>Alt</b> - <b>B</b>

49	<b>Alt</b> - <b>N</b>
50	<b>Alt</b> - <b>M</b>
59	<b>F1</b>
60	<b>F2</b>
61	<b>F3</b>
62	<b>F4</b>
63	<b>F5</b>
64	<b>F6</b>
65	<b>F7</b>
66	<b>F8</b>
67	<b>F9</b>
68	<b>F10</b>
71	<b>Home</b>
72	<b>↑</b>
73	<b>PulUp</b>
75	<b>↓</b>
77	<b>→</b>
79	<b>End</b>
80	<b>↓</b>
81	<b>Push</b>
82	<b>Ins</b>
83	<b>Del</b>
84	<b>Shift</b> - <b>Z</b>
85	<b>Shift</b> - <b>Z</b>
86	<b>Shift</b> - <b>F3</b>
87	<b>Shift</b> - <b>F4</b>
88	<b>Shift</b> - <b>F5</b>
89	<b>Shift</b> - <b>F6</b>
90	<b>Shift</b> - <b>F7</b>
91	<b>Shift</b> - <b>F8</b>

92	<b>Shift</b> - <b>F9</b>	122	<b>Alt</b> - <b>3</b>
93	<b>Shift</b> - <b>F10</b>	123	<b>Alt</b> - <b>4</b>
94	<b>[Ctrl]</b> - <b>F11</b>	124	<b>Alt</b> - <b>5</b>
95	<b>[Ctrl]</b> - <b>F12</b>	124	<b>Alt</b> - <b>6</b>
96	<b>[Ctrl]</b> - <b>F1</b>	126	<b>Alt</b> - <b>7</b>
97	<b>[Ctrl]</b> - <b>F2</b>	127	<b>Alt</b> - <b>8</b>
98	<b>[Ctrl]</b> - <b>F3</b>	128	<b>Alt</b> - <b>9</b>
99	<b>[Ctrl]</b> - <b>F6</b>	129	<b>Alt</b> - <b>0</b>
100	<b>[Ctrl]</b> - <b>F7</b>	130	<b>Alt</b> - <b>1</b>
101	<b>[Ctrl]</b> - <b>F8</b>	131	<b>Alt</b> - <b>2</b>
102	<b>[Ctrl]</b> - <b>F9</b>	132	<b>[Ctrl]</b> - <b>PageUp</b>
103	<b>[Ctrl]</b> - <b>F10</b>		
104	<b>[Ctrl]</b> - <b>F11</b>		
105	<b>[Alt]</b> - <b>F2</b>		
106	<b>[Alt]</b> - <b>F3</b>		
107	<b>[Alt]</b> - <b>F4</b>		
108	<b>[Alt]</b> - <b>F5</b>		
109	<b>[Alt]</b> - <b>F6</b>		
110	<b>[Alt]</b> - <b>F7</b>		
111	<b>[Alt]</b> - <b>F8</b>		
112	<b>[Alt]</b> - <b>F9</b>		
113	<b>[Alt]</b> - <b>F10</b>		
114	<b>[Ctrl]</b> - <b>PrtSc</b>		
115	<b>[Ctrl]</b> - <b>→</b>		
116	<b>[Ctrl]</b> - <b>↑</b>		
117	<b>[Ctrl]</b> - <b>End</b>		
118	<b>[Ctrl]</b> - <b>PgUp</b>		
119	<b>[Ctrl]</b> - <b>Home</b>		
120	<b>[Ctrl]</b> - <b>↓</b>		
121	<b>[Ctrl]</b> - <b>↓</b>		



# Chapter 7

## Advanced configurations

In this chapter, you will learn

- How to connect up to 45 Logical Connection boxes together with a single pair of wires (commonly called a "twisted pair").
- How to connect two Logical Connection boxes to a pair of modems, and give every device on either one of them access to every device on the other, simultaneously!

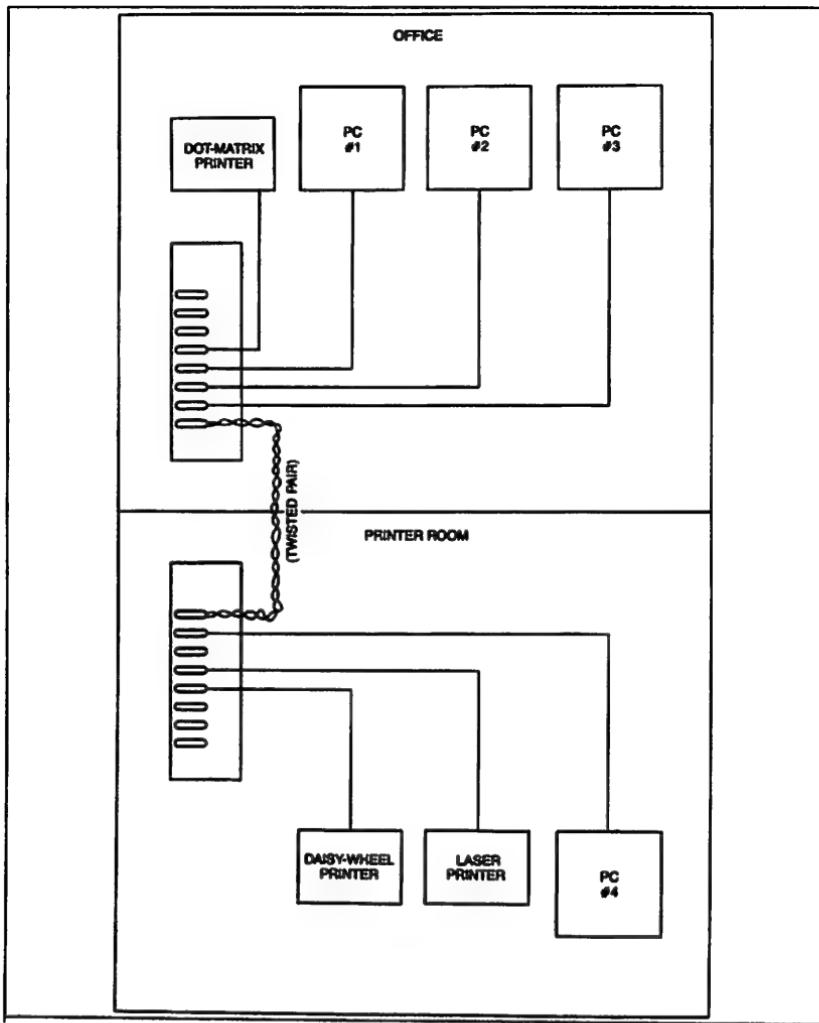
Both of these options use some special features of serial port #0.

### Daisy-chaining

This first option allows each interconnected box to talk to any other box directly – without going through the other boxes – no matter how many Logical Connections you have hooked together.

Serial port #0 has a special feature to allow this sort of connection. When boxes are connected to one another, port #0 is automatically configured to operate as an RS-485 communications port, and may not be used for anything else. Communications between boxes occurs very fast; much faster than normal RS-232 interfaces will allow. Also, this special interface allows a very long cable (up to 3/4 mile, depending on the quality of cable used), which is handy for routing data between rooms in a big office building.

As an example, consider the diagram below:



This simple network uses two **Logical Connection** boxes to interconnect three PC's and a dot-matrix printer in the "Office," and one PC, a laser printer and a daisy-wheel printer in the "Printer Room."

In the next few pages, we will "create" this setup by:

1. Configuring each **Logical Connection** box, using the **LCSETUP** program,
2. Connecting the boxes and devices together with the proper cables,

3. Setting up the proper configuration files so that each PC can instantly switch devices with the memory-resident POPLC program.

## Configuring the first LC box

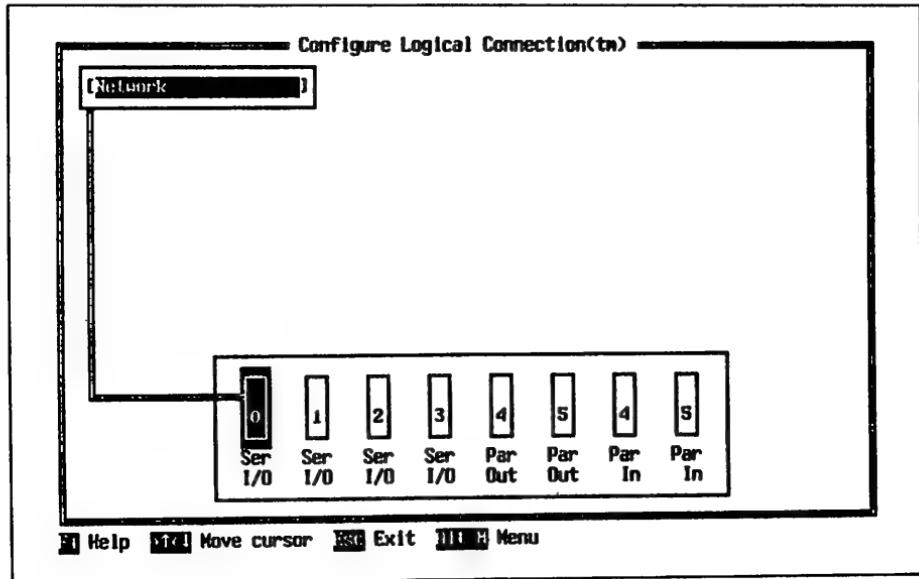
Daisy-chaining Logical Connection boxes together is very simple, and the configuration steps for each box in the chain are pretty much the same as for a single box, with a few minor differences.

Since you will be connecting the LC boxes together through their SERIAL #0 ports, you may not connect any *devices* (such as PC's or printers) to any of these ports.

Instead, you must create an "imaginary" device called "Network" for each SERIAL #0 port.

To begin our sample "daisy-chained" configuration, call up the LCSETUP program and select "Configure Logical Connection" from the main menu. If you need instructions for running LCSETUP, please refer to Chapters 4 and 5.

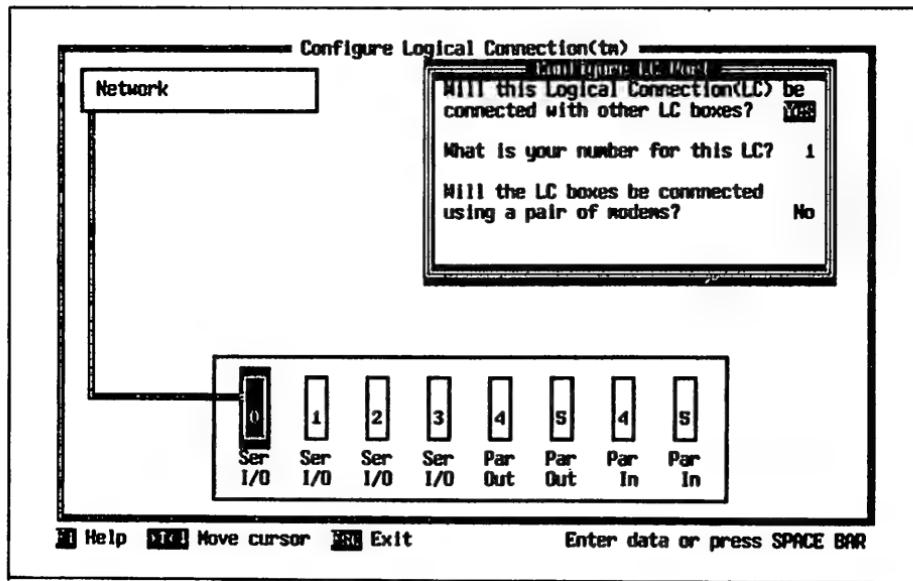
Your first step is to add a "device" to port SERIAL #0, and give it the description, "Network."



## Enter a box #

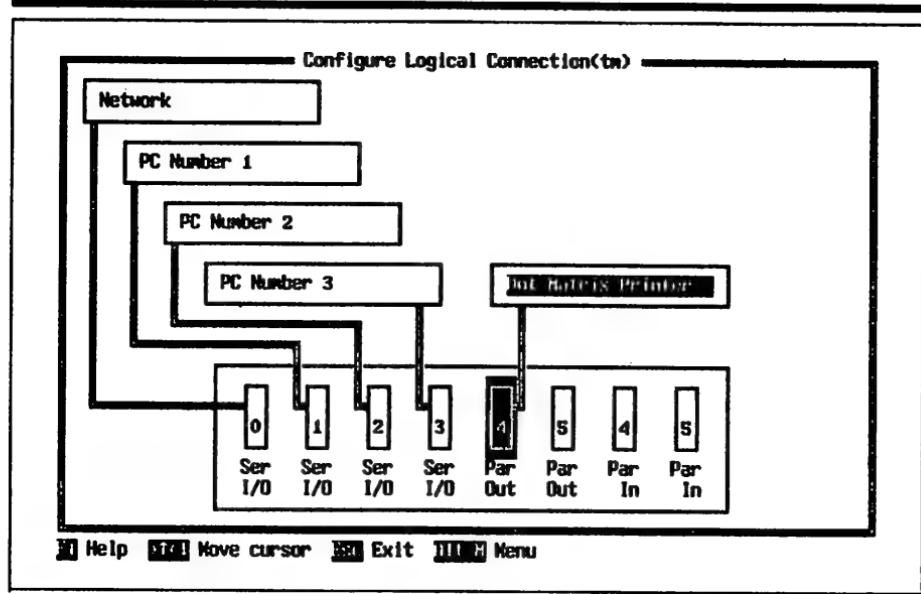
Then, call up the "Configure LC Port" screen by pressing **Alt-C**, and toggle the SPACE BAR once to answer "YES" to the question, "Will this Logical Connection box be connected to other boxes?" When you do so, the menu will ask you for a unique 2-digit "box number," (from 1-45). The Logical Connection will use this number when making connections from one box to another.

Since this is the first Logical Connection box on our example setup, leave the number set to 1:



The important thing to remember here is that each separate Logical Connection box *must* have a *unique* number. If you leave this one as #1, you *must* choose a *different* number for your other boxes when you configure them – otherwise The Logical Connection will have no way of addressing their separate devices.

When you are ready, press **Esc** to enter your choices. Then add the 3 PC's and the parallel dot-matrix printer to your diagram, using the procedure outlined in Chapter 5. Your diagram should look something like this:

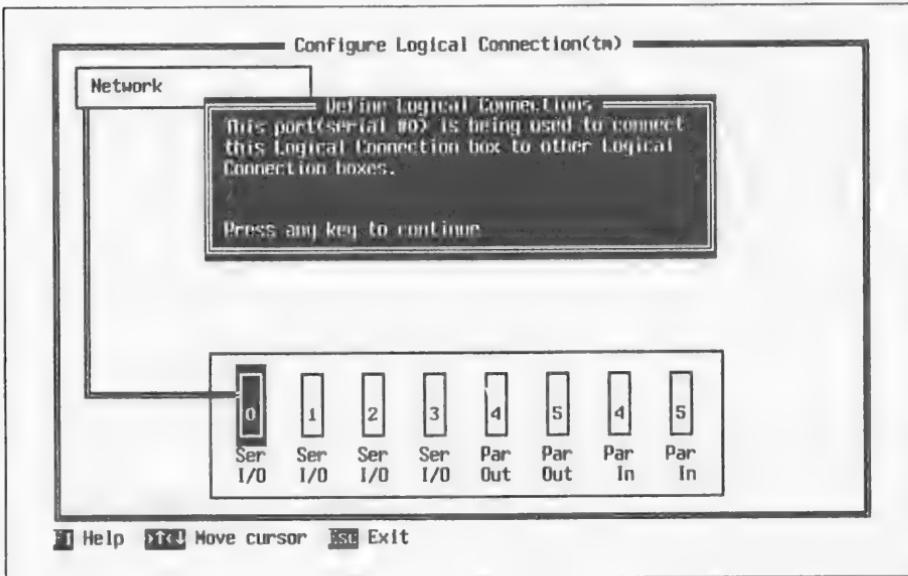


## Defining your connections

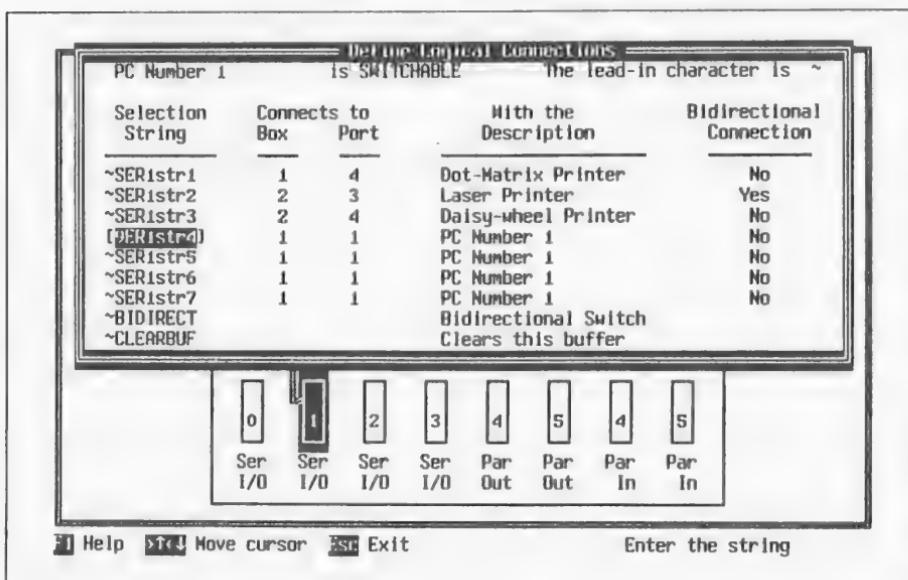
The rest of the setup process is pretty straightforward. Just remember

1. You cannot define any connections for port SERIAL #0, since it is now “dedicated” to serving your box-to-box communications.
2. You must now define a **Box #** as well as a **Port #** when defining your connections.
3. You cannot define **FIXED** connections between ports on separate boxes – such connections must be **SWITCHABLE**.

For example, if you try pressing **Alt-D** to define connections for port SERIAL #0, you will get the following message:



Go through now and configure each device, then define their logical connections, giving each PC access to *all three* printers. Your connections for port SERIAL #1 (PC Number 1) should look like this:

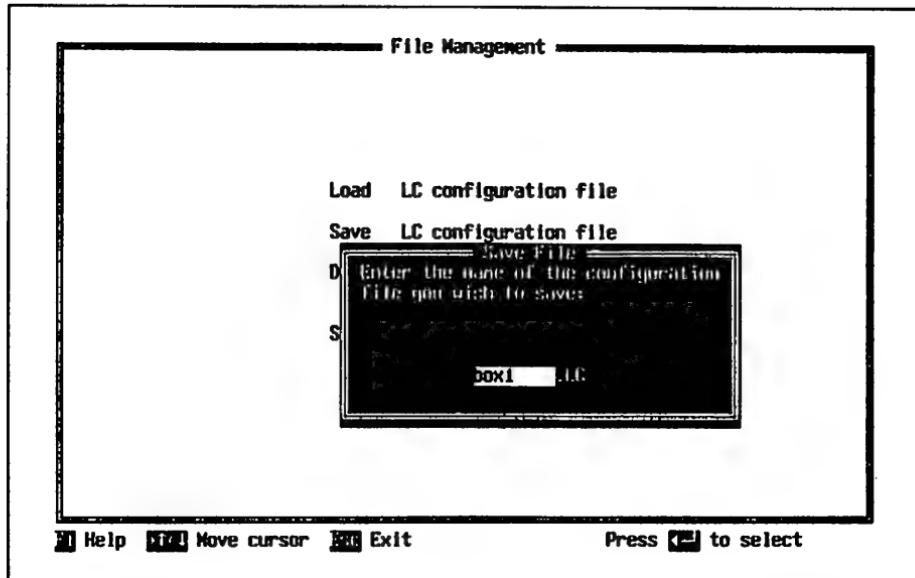


Your descriptions will change automatically when you enter a port number for Box 1, just as they did with single-box configuration. When you enter a port number for Box 2, however, you must type in the description yourself, since LCSETUP cannot know what is on another box's configuration.

## Saving the setup

When you have completed your configuration for Box1, you should *save it to a file* rather than sending it to The Logical Connection immediately. Since you will be configuring two separate boxes in this session, you don't want one of them to get lost accidentally.

To do this, press **Esc** to return to the main menu, choose the "File management" option, then select "Save LC configuration file". When the "Save File" box appears, type in **box1** as your file name, then press **Enter**.



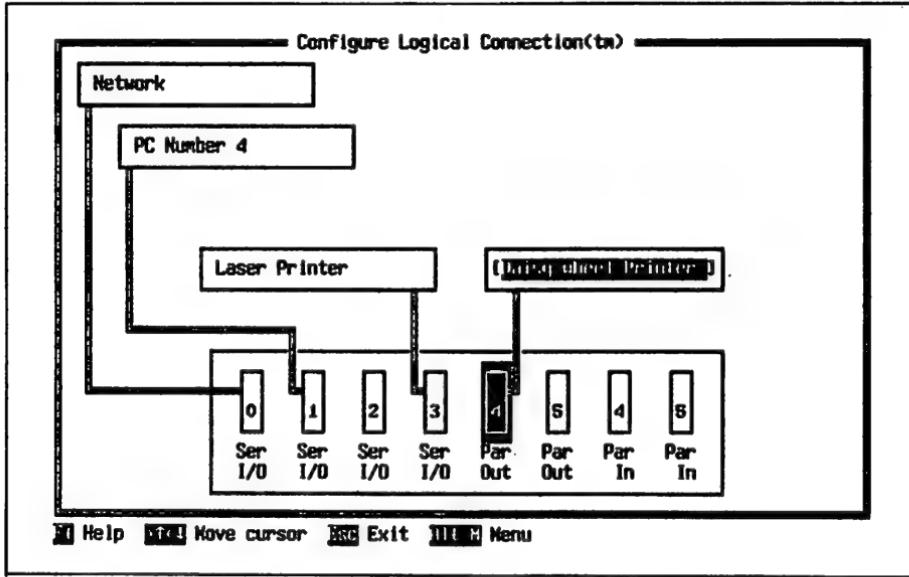
Your configuration is now saved, and you may proceed to configure the **second Logical Connection box**.

## Configuring the second LC box

If you were to return immediately to the “Configure Logical Connection” screen, it would still contain the Box 1 configuration you just completed. To simplify matters, clear out this configuration by re-loading the default configuration file (CONFIG.LC).

Simply select “Load LC configuration file” from the File Management menu, highlight “CONFIG.LC,” and press .

Now return to the main menu by pressing  and select “Configure Logical Connection.” Add your devices for Box 2 as follows:



### Configurations for Box 2

When you configure the SERIAL #0 (“Network”) port, identify the LC box as #2:

Configure Logical Connection(tm)

Network

Configure LC Port

Will this Logical Connection(LC) be connected with other LC boxes? Yes

What is your number for this LC?

Will the LC boxes be connected using a pair of modems?

No

Help Move cursor Esc Exit

Enter a number between 1 and 45

Since you will have a printer connected to the SERIAL #3 port, change its default configuration to add an **Automatic Form Feed** and a short **Time Out** period:

Configure Logical Connection(tm)

Laser Printer

Configure LC Port

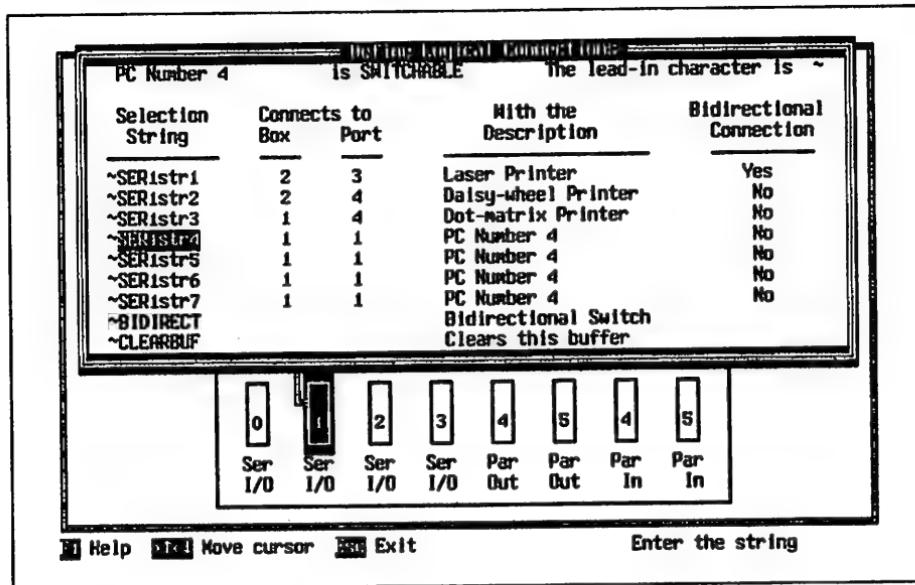
Baud Rate	9600
Parity	None
Word Length	8
Handshaking Protocol	Hardware
Automatic Form Feed	Yes
Time Out (in seconds)	<input type="text" value="10"/>

Help Move cursor Esc Exit

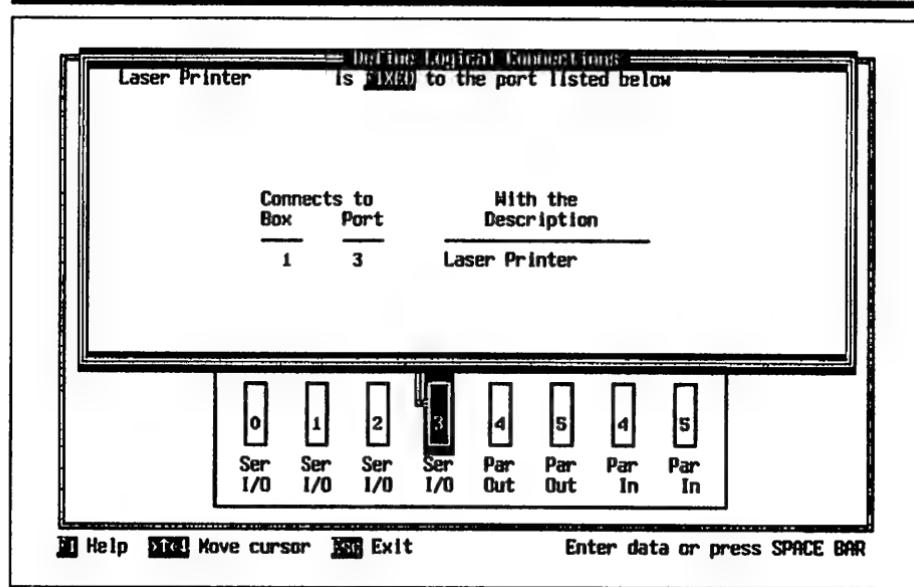
Enter a number between 0 and 255

## Connections for Box 2

The only SWITCHABLE connections you will have to define are for port SERIAL #1. You can enter these pretty much the same as you did for the PC's on Box 1, giving PC #4 access to all three printers:



Finally, you should change the connections for the Laser Printer (port SERIAL #3) to FIXED:



## Sending your configurations to the LC

After you have finished configuring **Box 2**, save the setup in a file named "BOX2.LC. Use the same procedure described above for saving the **BOX1** configuration."

Now you may send each configuration, one by one, to your two Logical Connection boxes. This procedure has been described in detail in **Chapter 5**. The only difference is that, since your configurations are stored as separate files, you must first load each one from the "File Management" menu, *then* choose "Send configuration to LC." For convenience, this last option from the main menu is repeated on the "File Management" menu, so you can load and send without ever leaving the screen.

**NOTE** – Since each PC must have its own CONFIG.LC file, which must contain the configuration for the box that that PC is plugged into, you should make a copy of the CONFIG.LC file after sending each of your two configurations. That way, the first one will be preserved when the LCSETUP program overwrites it with the second.

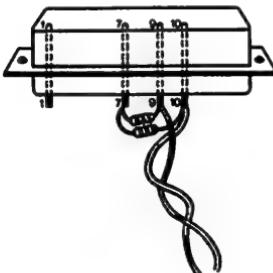
## Connecting your "daisy-chain"

When you have finished separately configuring *each* Logical Connection box (including defining the connections you want between devices on different boxes) just plug all of your Logical Connection boxes together over pins 9 and 10 of their Serial ports #0. The recommended cable and pin terminations are listed below and described in detail in Appendix A.

That's all there is to it! The Logical Connection's computer will configure the ports correctly and establish the communications link automatically.

### Twisted-pair cable

While you may use practically any two-wire cable to link your boxes together, you will get longer distances and better performance from better-quality cable. For best results we recommend an RS-485 shielded twisted-pair cable with a characteristic impedance of 120 ohms, Belden Type 9841 or equivalent. If you are attaching your own connectors, use standard DB-25 female connectors and attach the two wires to pins 9 and 10. All pin 9's are tied together, all pin 10's are tied together. Attach the cable shielding to pin 1. The cable ends must be terminated with a resistor of the same value as the characteristic impedance of the cable (put the resistor across the two wires). "T" or "spur" connections are not permitted.



NETWORK PIN TERMINATION

If you choose to make up your own unshielded cable - or use existing

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telephone wiring – just connect the two wires to pins 9 and 10 and terminate each end of the cable with the appropriate resistor. Remember that unshielded and/or small diameter cable will degrade maximum performance, so experiment first if there are long distances or many boxes to be connected.

## Using the network

Once your “daisy-chained” network is complete and your devices plugged in, you will be able to talk to remote devices on other Logical Connection boxes just as easily as to devices in your own room. Nothing special is needed, and you can use the POPLC *memory-resident* switching program just as you would if all your devices were connected to the same box.

Just make sure that

1. Each PC has a copy of the POPLC.EXE program.
2. Each PC has a copy of the correct CONFIG.LC file for the box to which it is connected.

If your CONFIG.LC files become lost or mixed up, you can recover them from the BOX1.LC and BOX2.LC files you created when setting up your configuration. Just insert a diskette into your PC's A: drive, and type (at the DOS prompt):

```
CD C:\LC [H]  
COPY BOX1.LC A:\CONFIG.LC [H]
```

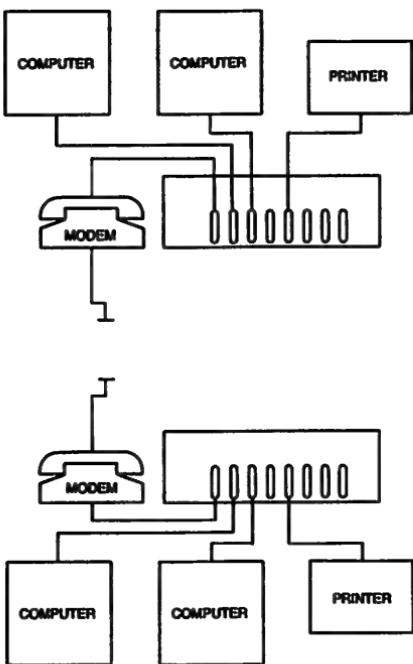
Do the same thing for the BOX2) configuration (on a separate diskette), and distribute copies of each to the appropriate PC's.

## Modems

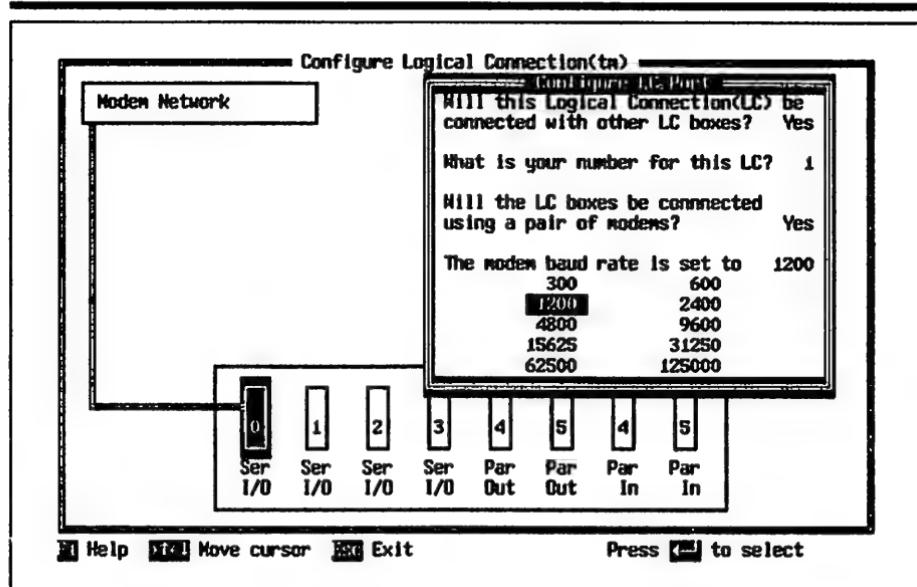
You may connect *any* Logical Connection serial port to a modem, allowing you to switch between the modem and other peripherals at will.

Serial port #0, however, supports a *special* kind of modem configuration that allows you to establish multiple connections *simultaneously* over a single telephone line.

For example:



To use this feature, give each LC box a number (just as you did for the "daisy-chained" example above. This time, however, answer "Yes" to the question, "Will the LC boxes be connected using a pair of modems?" on port SERIAL #0's "Configure LC Port" window:



When you have done so, you will be asked to enter a *baud rate code* for the connection. The available baud rates are listed in the window: just select one of them by highlighting it with the cursor and pressing  $\leftarrow$ . It is critical that you enter the **SAME** baud rate for *both* Logical Connection boxes, and that you set your modems to operate at that speed.

After that, you may proceed with the normal configuration process for each box. You may now make as many logical connections as you wish between one box and the other, and they can all operate simultaneously over the single modem connection. When you have finished configuring each box, plug both modems into the respective serial ports #0, and you're ready to go!

## File-sharing

Please note that while **The Logical Connection** provides the "multiplexing" for such long distance communication, it does **NOT** take the place of the communications software you would normally need to make a modem connection between one computer and another. If you want to transfer files from one location to another, for example, each computer involved in the transfer will still need a file sharing utility program.

On the other hand, if you just want to send a file from one location to be printed out on a printer at the other location, just send the appropriate "selection string" and print it out!



## **PART III**

# **For Non-IBM Compatible Systems**

## **Notes:**

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# Chapter 8

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## Getting Started

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If you do not have an IBM-PC or PC-compatible computer that you can use to set up **The Logical Connection**, you will not be able to use the special **LCSETUP** program on the Utility Disk. As a result, your configuration process will be a bit more complicated.

To access **The Logical Connection**'s configuration menu directly, you will need either:

1. A "dumb" terminal, such as a VT-100, or
2. A "terminal emulation" program for your computer (most communications programs, such as Crosstalk, BLAST or PCWorks, can function as terminal emulators).

You will also need the correct cable to connect the terminal's serial port to **SERIAL #0** port of **The Logical Connection** (see Chapter 12).

Our goal in this chapter will be to call up **The Logical Connection**'s configuration menu on your terminal, so that you can answer the questions about what devices you'll be hooking up to **The Logical Connection** and how you want them interconnected.

# Connecting the terminal

The first step in calling up the configuration Menu is to plug your terminal (or terminal emulator) into **The Logical Connection's SERIAL #0 port.**

## The terminal cable

Depending on how your terminal's ports are set up, you will need either a "straight-through" RS-232 cable or a "null-modem" cable.

The special red **PC Serial Cable** that came with **The Logical Connection** is a null-modem cable. If your terminal's serial ports are set up like the ports on an IBM-PC, this is the cable you should use.

If you do not know how your terminal is set up, or for more information on cables, refer to **Chapter 12.**

## Terminal settings

Set your terminal for 8 data bits and no parity, at the highest of the following baud rates it will support: 300, 600, 1200, 2400, 4800 or 9600 baud. **The Logical Connection** will detect the baud rate and adjust itself accordingly.

## Calling up the menu

The configuration menu itself is actually stored in ROM (Read Only Memory) inside **The Logical Connection**. When you answer its questions, your answers will be stored in battery-backed RAM (Random Access Memory), so **The Logical Connection** will "remember" how you have everything set up even if you leave it unplugged for a long time - up to ten years.

## The transformer

Plug the transformer cord into the socket provided in the left side of **The Logical Connection**. Make sure that all three pins are properly aligned.

Plug the power supply transformer into a 110-120V grounded wall socket.

## Reset and escape

To avoid the possibility of *accidentally* entering the configuration menu, it can only be accessed by transmitting an "ESCAPE" character within 15 seconds after powering up or resetting **The Logical Connection**.

- Press the **RESET** switch on the left side of **The Logical Connection**. The red **STATUS** LED will turn ON (steady), and the **RUN** LED will flash rapidly (about twice a second).
- Press the **Esc** (ESCAPE) key on your terminal within 15 seconds until **The Logical Connection**'s "sign-on screen" appears. At this point the **RUN** L.E.D. will begin flashing slowly (about once a second).
- Press **[Esc]** to enter **The Logical Connection**'s menu and begin the step-by-step configuration process.

**NOTE:** If your **Logical Connection** is an older model without a **RESET** switch, you must reset it manually by unplugging the transformer for a few seconds, then plugging it back in again.

If the menu does not appear, reset your **Logical Connection** and try again. If the menu still does not appear, check to make sure your cable is firmly connected to the correct port on your terminal and to **SERIAL #0** port on **The Logical Connection**. If this still does not work, you may have the wrong cable. Try inserting a "null modem adapter" (a device that swaps the receive and transmit lines from one side to the other) between your terminal and the cable, and begin again at Step 3. Finally, if you are still unable to bring up the menu, call the Technical Support number listed in the rear of this manual for assistance.

Now that you have called up the menu, you must answer each question. For a discussion of these questions and a look at the menu screens themselves, please turn now to **Chapter 9**.



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# Chapter 9

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## The Configuration Menu

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### The physical connections

Before you can actually hook up your devices with the proper cables, you must tell **The Logical Connection** what will be connected to each port, and define the proper configurations for each device so that **The Logical Connection** will be able to talk to them properly. For serial devices, all commonly used baud rates, communications protocol, parity, and word length options are supported. Parallel devices do not need any special configuration.

To make a successful physical connection, you will probably need the manual for each piece of equipment to figure out how to set it up (or how it's currently set up). Write down all the necessary setup information on the **CONFIGURATION ASSIGNMENT FORM** provided for this purpose.

Once you have this information on hand, you must call up the **CONFIGURATION MENU**, which is stored in **The Logical Connection's Read-Only Memory (ROM)**, and answer each question. Complete instructions for calling up the menu on a "dumb" terminal or non-IBM compatible computer (with a terminal emulation program) appear in Chapter 8.

## Editing Functions

When you are entering information in response to the Configuration Menu's prompts, you may use the following editing keys to correct any mistakes you may make:

**[BkSp]**: Erase character to the left of cursor.

**[Del]**: Erase character at cursor.

**[Ctrl]-[A]**: Move cursor to beginning of line.

**[Ctrl]-[F]**: Move cursor to end of line.

**[Ctrl]-[S]**: Move cursor one character left.

**[Ctrl]-[D]**: Move cursor one character right.

**[Ctrl]-[V]**: Insert a space at the cursor position.

**[Esc]**: Undo changes to this line and re-do.

**[Enter]**: Accept the line as you see it.

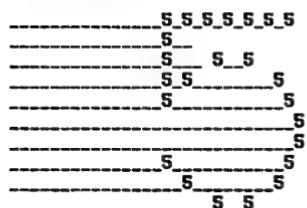
You'll hear a beep whenever the line length is exceeded or if you type characters the computer is not expecting.

## The Menu screens

When you call up the menu by "powering up" The Logical Connection and pressing **[Esc]** within 15 seconds, the first thing you will see is the "sign on" screen:

The LOGICAL CONNECTION (tm)  
Version 3.01  
Copyright (c) 1987 by Fifth Generation Systems, Inc.  
All rights reserved.

The LOGICAL CONNECTION is a trademark of Fifth Generation Systems, Inc.



FIFTH  
GENERATION  
SYSTEMS

Innovative Products Using Today's Technology

Press <return> to continue

Press F1 for HELP   |  Press F10 to EXIT   |  Current Port: COM 1

### Screen #1 – The sign-on screen.

Press **[→]** to leave this screen, and the following screen will appear:

You may connect up to 45 Logical Connection (tm) boxes together with a simple pair of wires just like your telephone uses. This "twisted pair" may be up to 4000 feet long -- THAT'S 3/4 MILE!! (Distance may vary depending on cable).

If you want to connect Logical Connection (tm) boxes in this way, serial port #0 will automatically be set to operate as a high-speed RS-485 communications port. You must assign each box a unique number so that data may be routed. You get to choose the number for each box (use numbers 1-45). Just remember that each box **MUST** have a **UNIQUE** number.

To interconnect two boxes over an RS-232 (modem) link, answer "N" to the twisted pair question below and select a baud rate for the link.

Code	Rate	Code	Rate
1	300	6	9600
2	600	7	15625
3	1200	8	31250
4	2400	9	62500
5	4800	10	125000

Is this box connected to other Logical Connection (tm) boxes? (Y/N) N

Press F1 for HELP   |  Press F10 to EXIT   |  Current Port: COM 1

### Screen #2

You will be asked if you want to connect this Logical Connection box to other Logical Connections, either across a pair of modems or on an

RS-485 "twisted pair" network. These options will be covered thoroughly in Chapter 11, "Advanced Configurations." For now, just assume that you are using only one Logical Connection, and answer "N" to the first question. The other questions will not appear.

Next, you will be asked to give a name to describe the location of this Logical Connection:

To help you remember where each box is located, a description of it's location should be entered here.

Identify the box by it's intended location (up to 20 characters).

Examples:

Bob's office

Computer room(Box 1)

Secretarial Pool

Swimming Pool

Where is this box located (20 chars)? THIS BOX'S NAME 20CH

Press F1 for HELP [ ] Press F10 to EXIT [ ] Current Port: COM 1

### Screen #3

You may enter any name you wish, up to 20 characters. As soon as you have done so and pressed **[+]**, the following screen will appear:

Now, you must identify the devices connected to each port, so The Logical Connection (tm) can communicate with each particular device. Later, you can connect devices to each other, but the job at hand now is to simply get each device to talk to the Logical Connection (tm).

NOTE: If you have indicated that this Logical Connection (tm) box will be connected to other boxes over Serial port #0, the following configurations will begin with Serial port #1.

Press <RETURN> to see the status screen displaying the current CONFIGURATIONS for each port.

Press <return> to continue

Press F1 for HELP   |  Press F10 to EXIT   |  Current Port: COM1

#### Screen #4

This is merely a brief explanation of what you will be asked to do in the coming series of menu screens. Just press **→** to continue.

After pressing **→**, you will see the CONFIGURATION STATUS SCREEN:

#### CONFIGURATION STATUS SCREEN

PORT #	IN OUT	DEVICE NAME	TIME OUT	FORM FEED	HANDSHAKING PROTOCOL	WORD LENGTH	PARITY	BAUD RATE
0	I/O	DEVICE NAME0	10	Y	BOTH	8	NONE	9600
1	I/O	DEVICE NAME1	10	Y	BOTH	8	NONE	9600
2	I/O	DEVICE NAME2	10	Y	BOTH	8	NONE	9600
3	I/O	DEVICE NAME3	10	Y	BOTH	8	NONE	9600
4	OUT	DEVICE OUT 4	10	Y				
5	OUT	DEVICE OUT 5	10	Y				
4	IN	DEVICE INP 4						
5	IN	DEVICE INP 5						

To list detailed information or make changes.

Enter port number (or 6 to exit) 0

Press F1 for HELP   |  Press F10 to EXIT   |  Current Port: COM1

## Screen #5 – CONFIGURATION STATUS SCREEN

Type the number of the first **Logical Connection** port you want to configure. As soon as you have entered a Port # and hit **[→]**, you will be asked a series of questions to “configure” that port for the device you are going to connect to it. (A REMINDER: Remember to fill out the “Configuration Assignment Form” *before* you sit down to go through the menu. Having the correct answers to all these questions on hand will save you a lot of time and hassle).

You should answer these questions according to the instruction manuals of the devices you are plugging into **The Logical Connection**. General information about each of these parameters may be found in the glossary.

The next screen is:

Each Logical Connection (tw) box can have up to 8 devices connected to it. Parallel ports 4 and 5 can each have TWO devices: one IN and one OUT. To help remember what goes where, assign a name (up to 12 characters) describing the device(s) connected to each port.

Examples:

Printer 1

LaserJet

Computer 3

PORT #0: Enter the device name for this port (12 chars) DEVICE NAME  
Press F1 for HELP [ ] Press F10 to EXIT [ ] Current Ports: CDR [ ]

## Screen #6

Just follow the instructions and type in a name of up to 12 characters, then press **[→]**.

The next screen asks you to define a **TIME OUT** period for the device:

It is possible that many other devices may send their output to this device at the same time. To manage these competing data streams when they occur, you must define a **TIME OUT** period. When one device is sending its output to this device, output from other devices will be spooled (stored in memory), until nothing more is received from the current device for the **TIME OUT** period you enter here. Only then will this port switch its attention to the waiting device.

If you wish, The Logical Connection (tm) will automatically send a form-feed character when the **TIME OUT** period has expired. If you are sharing a printer, this will ensure that the next user's document begins on a fresh sheet.

```
PORt #0: Enter the TIME OUT in seconds (0-255) 10
PORt #0: Do you want an automatic form-feed after TIME OUT (Y/N)?: Y
Press F1 for HELP   |  Press F10 to EXIT   |  Current Port: COM1
```

### Screen #7

Since any device plugged into The Logical Connection can possibly be "shared" by other devices (that is, more than one other device may ask to be connected to this device at the same time), the **TIME OUT** period is a way of avoiding possible conflicts. If this device is a printer, for example, and you want to make sure that whoever requests the printer first gets to keep it until all his documents are finished printing, you should define a relatively long **TIME OUT** period (it can be up to 255 seconds. That way, after the first document is received, The Logical Connection can wait for over four full minutes to see if any more documents are coming, before giving control of the printer to another device that might be waiting.

On the other hand, if you want to maximize throughput by printing documents one after the other as fast as possible, you should choose a short **TIME OUT** period of about 10 seconds – just long enough to make sure that the document is really finished printing (you wouldn't want to switch connections in the middle of a document if the program doing the printing happens to pause momentarily).

If the device you are connecting to this port is a printer, you should answer "Y" to the automatic form-feed. Otherwise, answer "N."

The next screen asks you to define the handshaking "protocol":

Since this is a serial port, you must define the type of "handshaking" protocol expected by the device connected to it. If you are in doubt, consult the instruction manual for the device (or choose "Both"). You may choose:

- 1 -- None
- 2 -- XON/XOFF protocol
- 3 -- Hardware protocol
- 4 -- Both

**PORt #0: Enter the protocol for this port (1-4): 4**

Press F1 for HELP

Press F10 to EXIT

Current Port: COM 1

### Screen #8

Choosing the incorrect protocol is a very common source of problems in serial interfacing. Just make sure you carefully study the manual for the device you are connecting, and select the type of protocol it is expecting.

One word of caution: if you are sending compiled programs or other *binary data*, you should choose *hardware* protocol for the link between your computer and The Logical Connection. This is because The Logical Connection will otherwise strip bytes having the same values as XON/XOFF signals from the data stream.

The next screen asks for the device's "word length."

A serial port breaks each character up into 'bits'. The number of bits in each character is called the "word length." This setting **MUST** match the word length expected by the device which is connected to this port. If you are in doubt, consult the instruction manual for the device.

**PORT #0: Enter the word length (6,7 or 8): 8**  
Press F1 for HELP   |    Press F10 to EXIT   |    Current Port: COM 1

### Screen #9

Again, the important thing is to match your entry here with the word length expected by the device you are hooking up.

The next screen asks you to define the "parity," another parameter which may be found in your device's instruction manual:

In addition to the data bits ("word length"), there may be a 'parity' bit added to verify that the character was sent without error. Again, this must match the parity expected by the device connected to this port. The options are:

- 1 -- NO PARITY
- 2 -- ODD PARITY
- 3 -- EVEN PARITY

**POR T #0: Enter the code for this port (1-3) 1**

Press F1 for HELP F2 for F10 to EXIT F11 Current Port: COM 1

### Screen #10

Finally, The Logical Connection will ask you for the device's "baud rate." This is the speed (in bits per second) that data transmission will occur.

The BAUD RATE is the rate that data is transferred between serial devices. The baud rate for the Logical Connection (tx) port **MUST** match the device it's connected to. Nothing will smoke if it's wrong; it just won't work.

Available baud rates:

Code	Rate
1	300
2	600
3	1200
4	2400
5	4800
6	9600

PORt #0: Enter the baud rate code (1-6): 6

Press F1 for HELP

Press F10 to EXIT

Current Port: COM1

This is the last question in the CONFIGURATION section of the menu. After you have answered it, you will be returned to the main configuration status screen (Screen diagram # 5). You will see the parameters you have just entered displayed on the screen, and you may now choose another port to configure.

**REMEMBER, The Logical Connection** can intelligently convert any of these parameters when it makes its connections, so you do NOT have to "match" your devices to each other. You just have to match **The Logical Connection** to each one. For example, if you want to drive a printer that is expecting no parity at 9600 baud from a computer serial port that is set for even parity at 4800 baud, no problem. Just configure each port correctly on the configuration menu – **The Logical Connection** will take care of the rest.

Please note that when you "configure" the PARALLEL ports, you will not be presented with all of these screens, since parallel interfaces don't require all these options. You'll just be asked to name the device you're plugging into the port.

# The logical connections

After all the physical connections have been made, **The Logical Connection** can talk to each device. The next step is to tell **The Logical Connection** how you want all these devices to talk to one another.

When a device transmits data, it is routed by the computer inside the **Logical Connection** box, to wherever you want it to go. That's why it's called "**The Logical Connection**"!

Instead of *physically* connecting devices, they are connected *logically* by the computer.

To make these logical connections, just enter 6 (to exit) at the configuration status screen's prompt. You will then be presented with a brief explanatory screen:

Now you must tell **The Logical Connection** (tm) how you want to logically "connect" the devices plugged into it. You will be given several choices to allow you almost unlimited flexibility in switching and sharing devices.

Press <RETURN> to see the status screen displaying the current CONNECTIONS for each port.

Press <return> to continue

Press F1 for HELP

Press F10 to EXIT

Current Ports:

COB 1

Screen #12

When you press **➡**, you'll see the CONNECTION status screen:

CONNECTION STATUS SCREEN

(NOTE: Parallel ports #4 - #5 have TWO connectors, one for Parallel OUT and one for Parallel IN. Only INput Ports can "make" connections.)

PORt	IN/OUT	DEVICE NAME	CONNECTED TO	CONNECTION MODE
#			BOX #	PORT#
0	I/O	DEVICE NAME0	1	0
1	I/O	DEVICE NAME1	1	1
2	I/O	DEVICE NAME2	1	2
3	I/O	DEVICE NAME3	1	3
4	OUT	DEVICE OUT 4		
5	OUT	DEVICE OUT 5		
4	IN	DEVICE INP 4	1	4
5	IN	DEVICE INP 5	1	5

NOTE: If ports are listed as SWITCHABLE, enter the port # to see detailed connections and selection strings.

To list detailed information or make changes,  
enter port number (or 6 to exit) 0

Press F1 for HELP    [ ]    Press F10 to EXIT    [ ]    Current Port: COM 1

Screen #13 – CONNECTION STATUS SCREEN

At the prompt, enter a port number. Of course, it must be a port you have already named (and configured, if serial) on the previous menu: it would be meaningless to "connect" a port to something if there is nothing plugged into the port!

When you have entered a port, you will be asked if you want to make the connection from that port **FIXED** or **SWITCHABLE**:

The Logical Connection logically "connects" incoming data streams to your choice of devices. These connections may be either **FIXED** or **SWITCHABLE**.

A **FIXED** connection is the same thing as hooking this input device directly to the selected output device (except, of course, that The Logical Connection will automatically handle any serial/parallel, protocol or other conversions that may be required).

A **SWITCHABLE** connection allows an active device (such as a computer or terminal) to SWITCH connections among different printers, plotters, modems or other peripherals at any time, simply by outputting a short "selection string" to tell The Logical Connection which device you want to be connected to at the time.

- 1 -- **FIXED CONNECTION**
- 2 -- **SWITCHABLE CONNECTION**

**PORT #0: Which way to connect this port? (1-2): 2**

Press F1 for HELP [ ] Press F10 to EXIT [ ] Current Port: COM1

#### Screen #14

Press 1 to make a **FIXED** connection or 2 for a **SWITCHABLE** connection, then press **[ ]**.

A **FIXED** connection simply means that The Logical Connection will always send any input from the device on that port to the device on one other port. When you choose this type of connection, you will be presented with the following screen and asked to name the port #.

**NOTE:** If you have "daisy-chained" multiple Logical Connection boxes together, you may *not* make a **FIXED** connection to a port on another box. "Box-to-box" connections must always be **SWITCHABLE**.

You have indicated that you want to make a **FIXED** connection between the device on this port and another device on a different port. Enter the Logical Connection (tm) port # of the device to which you want this port connected. **FIXED** connections must be within the same box.

**PORt #0: Enter the connected to port number: 0**

Press F1 for HELP ||| Press F10 to EXIT ||| Current Ports: COM 1

Screen #15

If, on the other hand, you have responded (on the previous screen) that you want to establish a SWITCHABLE connection, the following screen will appear:

You have indicated that the device on this port is to be SWITCHABLE. This means that it can be connected to any one of several other devices "on the fly." To make these connections you must define an 8 character SELECTION STRING for each device you want to be able to connect to. You may also define a SELECTION STRING to clear the buffers for this port.

All selection strings for this port must be preceded by a lead-in character (such as ~ or ^) which should occur infrequently in the data stream.

PORt #0: Enter the lead-in character here:  
Press F1 for HELP ||| Press F10 to EXIT ||| Current Port: COM 1

### Screen #16

You should choose a SWITCHABLE connection if you are hooking up a computer that you want to be able to SWITCH among different printers, plotters, etc. You will make these switches by means of short "selection strings" that you can imbed in your text files or send out in other ways (see the "Practical Applications" section for a more detailed discussion of how to use selection strings).

The first step in defining selection strings for the devices you want this device to be able to switch to, is to enter a special "lead-in" character. As the prompt indicates, you should choose a character that you do NOT expect to appear frequently in your documents. This is because The Logical Connection will momentarily pause whenever it sees this character to check and see if the following 8 characters are one of your selection strings. The same lead-in character will be used for all the selection strings you define for this port.

When you have entered the lead-in character, you will be switched to the following screen:

Now you may define SELECTION STRINGS for up to 7 different devices you want this port to have access to, plus the selection string to CLEAR BUFFERS and establish BIDIRECTIONAL CONNECTIONS. Remember to begin each keyword with the special lead-in character, followed by exactly 8 other characters. NOTE: You MUST enter a selection string and connection assignment on line 1 -- this will be the default connection when no selection strings are sent.

SELECTION STRING:	CONNECTS THIS PORT TO	BOX #:	PORT #:
1 ^S01-0...	1	0	
2 ^S01-1...	1	1	
3 ^S01-2...	1	2	
4 ^S01-3...	1	3	
5 ^S01-4...	1	4	
6 ^S01-5...	1	5	
7 ^S10-2...	1	2	
8 ^S10-3...			
9 ^CLEAR...			

NEXT CONNECTION IS TO BE BIDIRECTIONAL  
CLEARS THIS CHANNEL'S BUFFERS

PORT #0: Enter the line number (or 0 to quit): 1

Press F1 for HELP [ ] Press F10 to EXIT [ ] Current Port: COM 1

### Screen #17

Start with line #1, and enter an 8-character selection string for each device you want to be able to SWITCH to. It's a good idea to use strings that make sense, so you'll be able to remember them when you want to switch connections "on the fly" – for example, you might use "^\\*laser1\*" to connect you to your laser printer, or "^\\*PrtRm2\*" to connect you to the second printer in a common printer room.

Enter the selection string exactly as you will use it (**The Logical Connection** does distinguish between upper and lower case). You *must* enter a *full 8 characters* after the lead-in character. The menu will "beep" you if you try to exceed 8 characters (9 including the lead-in character). It is a good idea not to use spaces in your strings, since some word-processors and print drivers will "strip" extraneous spaces, and therefore might not transmit your strings exactly.

It is essential to make an entry on line 1, since that will be the "default" connection **The Logical Connection** will make if it receives NO selection strings.

After you have entered the selection string, you will be asked to name the port # of the device to which you want that string to connect you. (Again, if you have "daisy-chained" two or more boxes, you must also enter the box #).

You will be given the opportunity to enter up to seven selection strings, to allow you to connect with up to seven other devices. You may also enter two special-purpose strings: one to clear the buffers for this channel (which you may want to do if a printer breaks down, for example, leaving a partial document in the buffer); and another to establish BIDIRECTIONAL communications on your next switch (see the Glossary for a more complete discussion of bidirectional communications – in essence, you simply send *both* the BIDIRECTIONAL string *and* the regular selection string when you want to make sure you have a two-way line open with another serial device for applications like file-sharing or modem communications).

When you have entered strings for all the devices you want, just enter 0 at the *line number* prompt. You will be returned to the Connection Status Screen (Screen #13), where you can enter another port number and define another set of connections for that device.

#### **A SPECIAL WORD ABOUT THE PARALLEL PORTS:**

The parallel OUT ports (that is, the connectors that go OUT from **The Logical Connection** to a printer or plotter) cannot be SWITCHABLE, since there would be no way for them to send a selection string to **The Logical Connection**, and it would make no sense to allow a printer to "switch" to a different computer. Therefore, the connections to these ports are made at the computer or terminal ports that will be sending data TO them, and you will only be asked to make connections for the parallel IN ports.

Once you have defined the logical connections for each port that you will have something plugged into, press 6 to exit the connection status screen. You will be asked,

#### **Place this box into operation?**

If you are satisfied with your configuration, simply answer "Y" to exit the menu. If you want to review your answers or make changes, answer "N" and you will be returned to the beginning of the menu.

Now, all you have to do is make sure all your cables are correctly hooked up (see Chapter 10), and you're ready to run! The configurations you have just made are permanently stored in battery-backed RAM, so you will not have to re-configure if you turn off **The Logical Connection** for the night. If you do need to change some of your configurations, you can

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re-call the menu for editing at any time by plugging a terminal (or computer with a terminal emulation program) into Serial port #0, resetting **The Logical Connection** and pressing **Esc** (ESCAPE) within fifteen seconds.



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# Chapter 10

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## Connecting the cables

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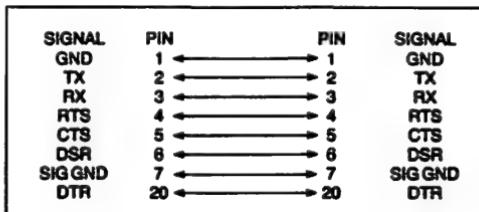
When you use **The Logical Connection**, it is not necessary to connect your computers and printers (or other devices) directly to one another. Instead, you connect each one physically to **The Logical Connection**, using the appropriate cable. **The Logical Connection** will accommodate both **SERIAL** (ports #0-#3) and **PARALLEL** (ports #4 & #5) devices.

Choosing the proper cables to connect each device to **The Logical Connection** can be the most difficult part of the process. However, there are a few simple rules to follow which will minimize the confusion.

### Serial cables

1. To connect a serial printer, plotter or other peripheral to **The Logical Connection**, use the same cable you would use to connect the same device to an IBM-PC. Since IBM has set the "standard" for PC's, practically *every* peripheral can be equipped with such a cable.
2. To connect a computer whose serial ports are set up the same way as an IBM-PC, ("DTE," with a male 25-pin connector – see Appendix A for an explanation of the terms DCE and DTE) to **The Logical Connection**, use the special red **PC Serial Cable** that came with this package. If you are hooking up more than one such computer, you may order additional cables from Fifth Generation Systems for a nominal fee – call the **TOLL FREE** number listed in the rear of this manual.
3. To connect a computer whose serial ports are set up as "DCE" to **The Logical Connection**, use a "standard" RS-232 cable with a female DB25 connector on one end and the appropriate connector for the computer port at the other end.

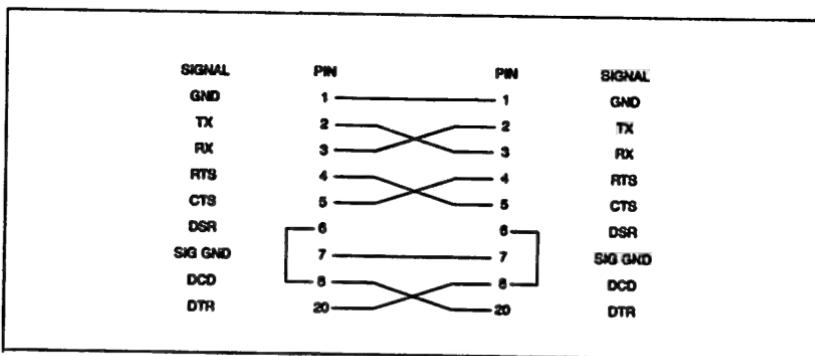
Ports 0-3 are SERIAL ports, which transfer data a bit at a time. Serial interfaces generally require a simpler cable than parallel interfaces; the cable may be as simple as 3 wires – transmit, receive, and ground. On the other hand, they may require a very complicated cable if all the optional “handshaking” and status lines must be connected. When the RS-232 serial communications standards were first developed, it was decided to call one wire “transmit” and another wire “receive”, regardless of which end of the cable you are looking at. This sounds simple, but it means that one end of the cable is receiving data on a wire called “transmit,” and vice-versa. This is a source of endless confusion and frustration. Serial connectors can be set up as “DCE” (Data Communications Equipment) or as “DTE” (Data Terminal Equipment). This works out fine if you’re connecting a terminal to a modem, since you can use a cable like this:



The problem is, how do you set up a serial port on a computer? Some companies assume that the ports will be connected to terminals (DTE), so they set up the computer ports to look like modems (DCE). Other companies assume that the ports will be connected to modems (DCE), so they set up the computer ports to look like terminals (DTE). There is NO standard way to set this up.

We elected to set up our ports to look like the serial ports on an IBM-PC (DTE). This means that you can go to your computer store and ask for a cable to connect printer “XYZ” to an IBM-PC, and plug the computer end into the Logical Connection. To connect The Logical Connection to an IBM-PC, you will need a “null-modem” cable (like the PC Cable supplied with The Logical Connection). A null modem cable swaps the wires so that two devices just alike can communicate (otherwise, each device would try to transmit to the other on the same wire).

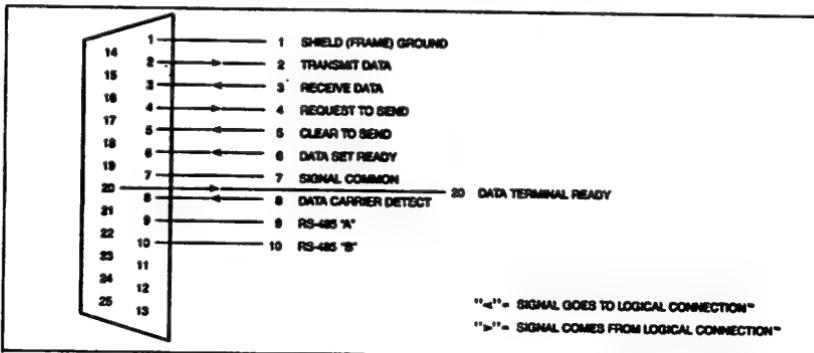
A null modem cable is shown below:



This is the "PC Cable" that came with your Logical Connection. You can create a similar cable by attaching a "null modem adapter" to a straight-through RS-232 cable (however, such a cable might not work for all applications, since a null modem adapter does not typically swap all the "status lines").

The maximum allowable length for a serial interface cable is determined by the baud rate (speed). The lower the baud rate (slower), the longer the cable can be. A list of suggested cable lengths is included in Appendix A. Be optimistic if you wish, but if you are experiencing signal degradation, try shortening the length of the cable or using a slower baud rate.

To assist you in locating the proper serial cables, a complete pin diagram of The Logical Connection's serial ports appears below:



Logical Connection Serial Port Diagram

# Parallel cables

## GENERAL RULES -

1. To connect a printer to **The Logical Connection**, use a cable designed to connect it to the IBM-PC. The parallel output ports look just like the printer ports on an IBM-PC.
2. To connect an IBM-PC or compatible's printer port to **The Logical Connection**, use a straight-through cable with the appropriate ends. If it plugs into the connectors, chances are good that it will work. If you have another kind of computer, ask for the correct *adapter* to convert the port to IBM standard. (If you have difficulty locating the correct adapter, contact our Technical Support staff at the TOLL FREE number listed in the rear of this manual).

A parallel interface has an individual wire for each "bit" in the "byte" being sent. All the bits are set up at once, side by side (hence the term "parallel"), then another wire in the cable is used to signal that the data is ready. A separate wire is used to signal back that the data has been read (it's ok to send the next byte).

As you can see, parallel interfaces require lots of wires in the cable. In addition, the cable length is restricted to about 12 feet because of electrical requirements and noise pickup (although many 25 foot cables are being used without noticeable problems).

On the bright side, parallel interfaces are more standardized than serial interfaces, so finding the right cable is much easier. If your parallel cable has the right connectors on each end, it's a pretty safe bet that you have the right cable.

If you should have any difficulty in locating the proper cable to connect any of your devices to **The Logical Connection**, serial or parallel, call the TOLL FREE Technical Support Number listed at the rear of this manual for assistance.

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# Chapter 11

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## Advanced configurations

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So far, we have just discussed using a single Logical Connection box. But for applications requiring additional ports – or where longer distances between devices are involved – there are two additional options:

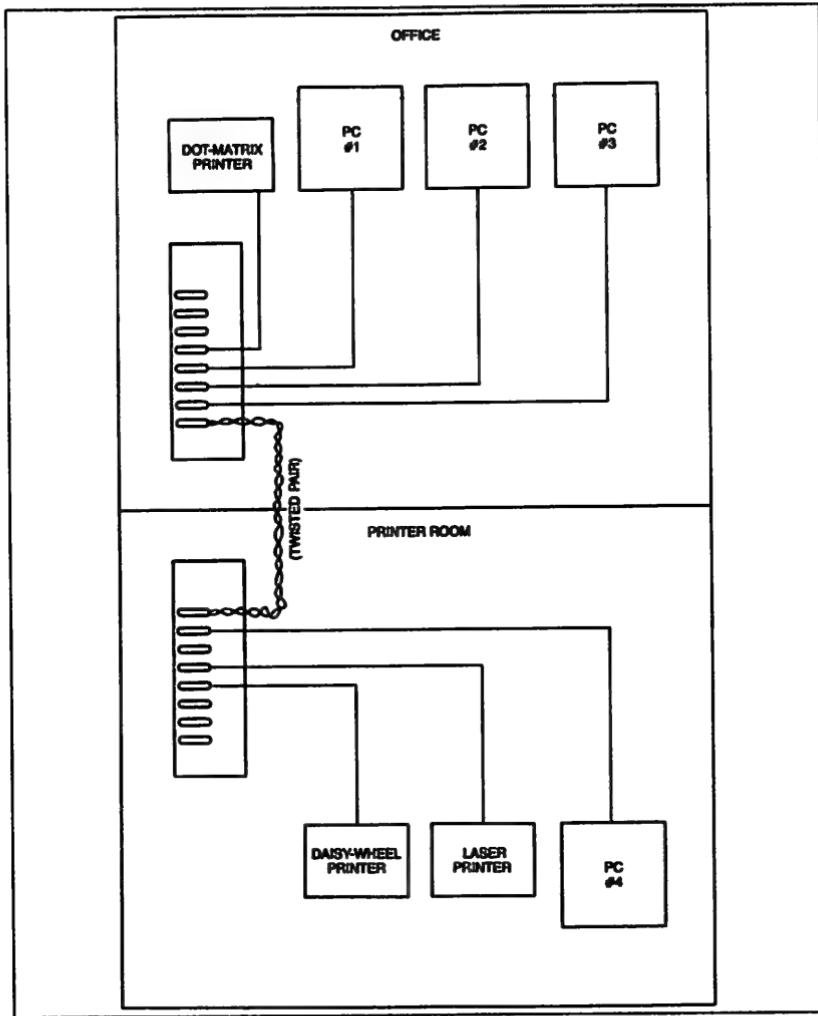
1. Up to 45 Logical Connection boxes can be connected together with a single pair of wires (commonly called a “twisted pair”). Or,
2. You can hook two Logical Connection boxes to a pair of modems, to give every device on either one of them access to every device on the other, simultaneously!

Both of these options use some special features of serial port #0.

### Daisy-chaining

This first option allows each interconnected box to talk to any other box directly – without going through the other boxes – no matter how many Logical Connections you have hooked together. Serial port #0 has a special feature to allow this sort of connection. When boxes are connected to one another, port #0 is automatically configured to operate as an RS-485 communications port, and may not be used for anything else. Communications between boxes occurs very fast; much faster than normal RS-232 interfaces will allow. Also, this special interface allows a very long cable (up to 3/4 mile, depending on the quality of cable used), which is handy for routing data between rooms in a big office building.

As an example, consider the diagram below:



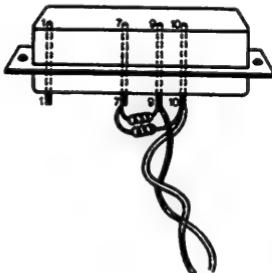
Daisy-chaining Logical Connection boxes together is very simple, and the configuration steps are pretty much the same as for a single box. All you have to do is:

1. When you first call up the configuration menu (see *Chapter 7*), answer "Y" to the question, "Will this Logical Connection box be connected to other boxes?" When you do so, the menu will ask you for a unique 2-digit "box number," (from 1-45) as well as an identifying name. You will use this number when making connections.

2. Configure each separate box the same way, but give each box a unique 2-digit number. Remember, you cannot make **FIXED** connections between ports on separate boxes – such connections must be **SWITCHABLE**.
3. Plug all of your Logical Connection boxes together over their Serial ports #0. That's all there is to it! The Logical Connection's computer will configure the ports correctly and establish the communications link automatically.

## Twisted-pair cable

You will get longer distances and better performance from better-quality cable. For best results we recommend an RS-485 shielded twisted-pair cable with a characteristic impedance of 120 ohms, Belden Type 9841 or equivalent. If you are attaching your own connectors, use standard DB-25 female connectors and attach the two wires to pins 9 and 10. All pin 9's are tied together, all pin 10's are tied together. Attach the cable shielding to pin 1. The cable ends must be terminated with a resistor of the same value as the characteristic impedance of the cable (put the resistor *across* the two wires). "T" or "spur" connections are not permitted.



NETWORK PIN TERMINATION

If you choose to make up your own unshielded cable – or use existing telephone wiring – just connect the two wires to pins 9 and 10 and terminate each end of the cable with the appropriate resistor.

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Remember that unshielded and/or small diameter cable will degrade maximum performance, so experiment first if there are long distances or many boxes to be connected.

## Configuration

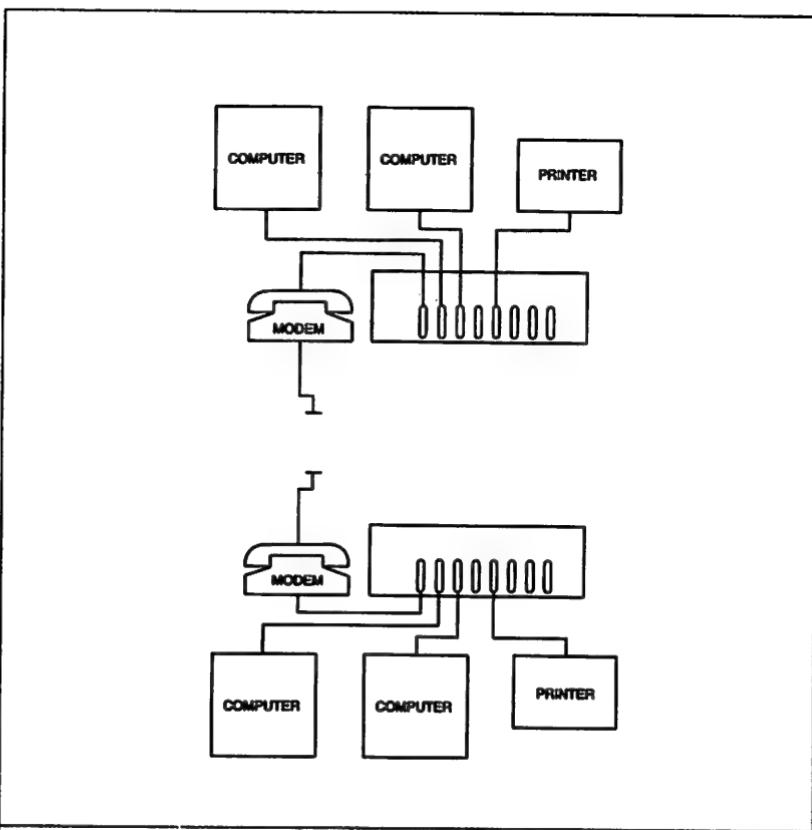
Configure each Logical Connection box exactly as described above, just as if each were a stand-alone unit. The only exceptions are that you must make box-to-box connections SWITCHABLE, and you will be asked to supply the "box #" as well as the "port #" when defining connections. Once you have done so, you will be able to talk to remote devices on other Logical Connection boxes just as easily as to devices in your own room.

## Box-to-box modem connections

You may connect any Logical Connection serial port to an external modem, allowing you to switch between the modem and other peripherals at will.

Serial port #0, however, supports a *special* kind of modem configuration that allows you to establish multiple connections *simultaneously* over a single telephone line.

For example:



To use this feature, you will need to answer "Y" to the question "Is this box connected to other Logical Connection boxes?" and "N" to the question "Use twisted pair?" at the beginning of **The Logical Connection's configuration menu**.

When you have done so, you will be asked to enter a *baud rate code* for the connection. It is critical that you enter the SAME baud rate for *both* Logical Connection boxes, and that you set your modems to operate at that speed.

After that, you will be asked to assign a box number and name to each box, then led into the normal configuration process. You may now make as many logical connections as you wish between one box and the other, and they can all operate simultaneously over the single modem connection. When you have finished configuring each box, plug both modems into the respective SERIAL #0 ports, and you're ready to go!

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Please note that while **The Logical Connection** provides the "multiplexing" for such long distance communication, it does NOT take the place of the communications software you would normally need to make a modem connection between one computer and another. If you want to transfer files from one location to another, for example, each computer involved in the transfer will still need a file sharing utility program.

On the other hand, if you just want to send a file from one location to be printed out on a printer at the other location, just send the appropriate "selection string" and print it out!

## Bidirectional connections

When two devices are connected to each other, the communication may be **one-way** (where one of the devices does all of the "talking" and the other one does all of the "listening") or **two-way** (where the devices "talk" back and forth to each other). The **two-way** connections are called "**Bidirectional**."

To make a bidirectional connection:

1. When you are entering the selection strings for a computer that you want to be able to connect to another computer (either on the same box or on another), enter a string on line 8 – the line that reads "**NEXT CONNECTION TO BE BIDIRECTIONAL**."
2. When you want to establish a two-way "conversation" with another computer, send two selection strings: **FIRST** the "**BIDIRECTIONAL CONNECTION**" string, **THEN** the string which connects you to the other computer. This will guarantee that you will capture the other computer's output until the connection is terminated.

A good example of a **one-way** connection would be a PC sending a document to be printed on a parallel printer. A good example of a **bidirectional connection** would be a PC interacting with an electronic "bulletin board" over a modem.

- A parallel connection *cannot* be bidirectional. Parallel interfaces are "**one-way**" only. (That's why **The Logical Connection** provides both **PARALLEL OUT** and **PARALLEL IN** ports.)

- A serial connection *can* be bidirectional and normally *should* be set up that way. Even a serial *printer*, for example, may send status codes or other information back to the computer that is sending it text to print. There are, however, exceptions to this rule.

The **Logical Connection** establishes a bidirectional connection by "capturing" the output of the serial device you are switching to. It does this by sending a separate "selection string" (you will see it on the menu with the description "**Bidirectional Switch**." In effect, this *forces* the target device to switch to *you* when you switch to *it*.

This is necessary when you *need* a two-way connection. Otherwise, you might switch connections to another PC and request a file-transfer (using a communications program), only to have the other PC send your file to the plotter that *it* was switched to before you called! On the other hand, however, it can be a real *nuisance* if you just need to send a message (through an electronic mail program, perhaps), but disrupt an important modem call the other PC was making by forcibly switching its output to you.

If this all sounds confusing, it *is*. Fortunately, however, there are a few basic guidelines you can follow in deciding whether to make a serial connection bidirectional:

1. Make all connections to peripherals (like printers, plotters or modems) bidirectional.
2. Make connections to another computer bidirectional if you will be using the connection interactively (like file-sharing applications or multi-user terminal emulation).
3. Do not make connections to another computer bidirectional if you do not *need* to guarantee two-way communication; especially if the other computer is using its serial port for other important applications.
4. When you may be using a connection to another computer in *both* sets of circumstances, make two separate **SWITCHABLE** connections to the same computer, one bidirectional and one not. When you need to switch connections to the computer, use the one that fits the circumstances.



## Chapter 12

# Using The Logical Connection

Congratulations! If you've made it this far, you have successfully configured **The Logical Connection** and are ready to start using it. This is the easy part!

Actually (once you have made sure all your cables are properly plugged in), there's really nothing special you have to do, unless your computer is plugged into a **SWITCHABLE Logical Connection** port and you want to **SWITCH** your output to another device. All you have to do is to output the "selection string" for the chosen device, including the special lead-in character, ahead of the output you want to send. There are several ways of accomplishing this:

1. Many software packages have special provisions for outputting printer codes along with documents to be printed. If the program you are using has such a provision, this is the easiest method to use.
2. You can make a separate file containing only the selection string, and "print" this file ahead of the file you want to print.

**NOTE** – If you are using an IBM-PC compatible computer, and you want to re-route your printer output through your com1 serial port, you can do this with the DOS "MODE" command:

First, set up the serial port with the parameters you have programmed into **The Logical Connection**. For example,

**MODE COM1:9600,n,8,1**

sets the port for 9600 baud, no parity, 8 data bits and 1 stop bit. Do *not* set the optional P flag on this command, as it may interfere with normal operation of **The Logical Connection**. See your DOS Manual for more details.

Second, re-route the printer output with the command:

**MODE LPT1:=COM1**

---

If you wish to use this configuration regularly, you may put the above commands in your **AUTOEXEC.BAT** file (see your DOS manual for details).

3. You can imbed your selection string directly into the text of the file you are sending. **The Logical Connection** will see it in the data stream, make the connection, and then discard it – so it will NOT appear in your printed document. Only text received *after* the string will be re-routed, so place the string at the beginning of the file (unless you want to change printers in the middle of a document).
4. You can copy the selection string directly through your computer's output port. To do this, you will need to consult your operating system's manual for the appropriate commands. (For IBM-PC compatible computers, the command is

**COPY *filename.ext* COM1: [LPT1:]**

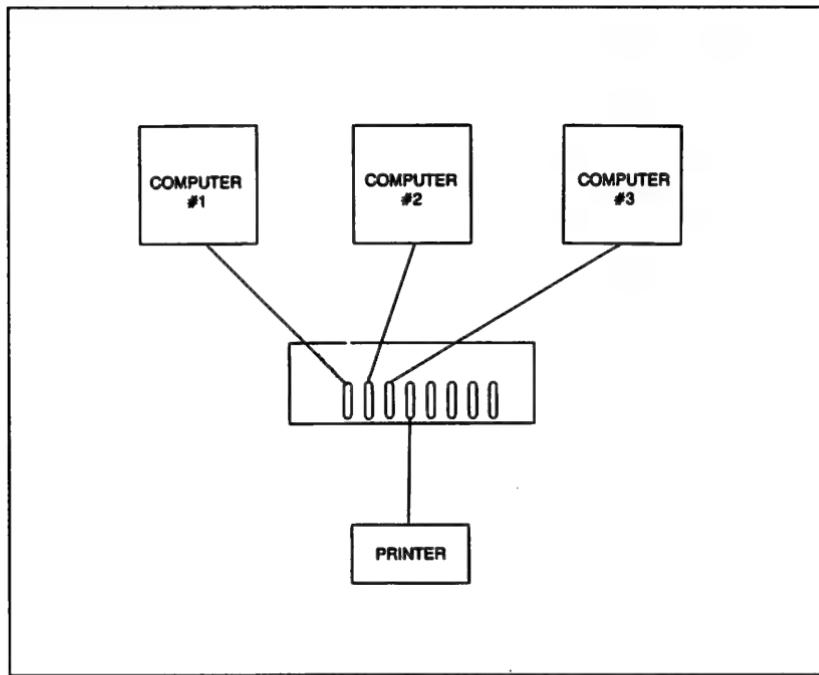
Remember, if you are switching connections to a modem or another computer through a communications packages, you will need to send the **BIDIRECTIONAL COMMUNICATIONS** string ahead of the selection string, to make sure a two-way connection is established. You can send both of these strings together (in the same file, for instance) to simplify your switching.

For **FIXED** connections, you need do nothing special at all. **The Logical Connection** already has its instructions, so you can just act as if the devices were directly connected to each other.

# Some examples

## How to share a printer between two or more computers

Here is a common configuration you can set up on a single **Logical Connection** box;



To set up this application, just –

- Step 1: Connect the printer to **The Logical Connection**. For serial OR parallel printers, the cable should be configured as if it would be connected to an IBM-PC.
- Step 2: Connect the printer ports from the computers to **The Logical Connection**. Serial or parallel – it doesn't matter; just be sure that you have the right cable (see **Appendix A**), and that your computer output is routed through the port you have connected.
- Step 3: Call up the configuration menu and configure the **Logical Connection** as described earlier. Define the computers as either **FIXED** or **SWITCHABLE** devices and logically connect each of them to the printer. The

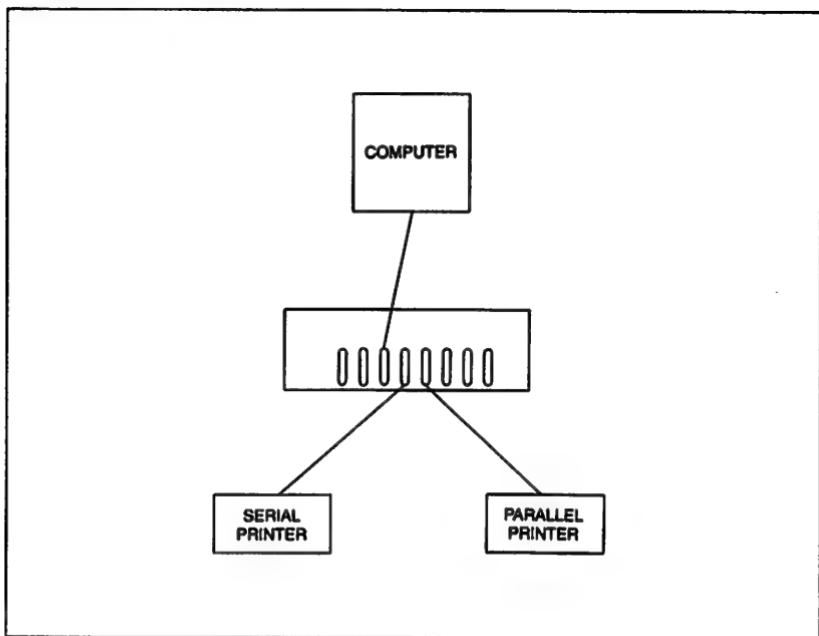
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time out you specify for the printer will be the time to wait before another computer can print. Here's how it works:

Assume the time out is 60 seconds. Computer #1 sends some data. Since the printer has been inactive for more than 60 seconds, printing starts immediately. While this is going on, Computer #2 starts sending. The printer is in use, so the data is buffered. Meanwhile, Computer #1 is finished sending data, but printing continues (remember that huge buffer?). 60 seconds after Computer #1 has sent the last byte, computer #2 is assigned the printer. Notice that because of the buffering action, printing has never stopped.

## How to talk to two or more printers with one computer

Another common application for **The Logical Connection** is giving a single computer a *choice* of printers to use. This is especially helpful in a situation where one printer is a parallel device and the other (possibly a laser printer) is serial:



Here's how to set up this configuration:

- Step 1: Connect the printers to the Logical Connection. For serial OR parallel printers, the cable should be configured as if it would be connected to an IBM-PC.
- Step 2: Connect the printer port from the computers to The Logical Connection. Serial or parallel – it doesn't matter.
- Step 3: Configure The Logical Connection as explained. Indicate that the computer printer port is SWITCHABLE. Then, specify 2 or more selection strings, one for each printer. For example:

Assume that you define the selection string for printer 1 as `~**LPT1**` and that the selection string for printer 2 is `~**LPT2**`. To print a document on printer 1, just include the selection

---

**string at the beginning of your document. Likewise, to switch to printer 2, include ~\*\*LPT2\*\* in your document. As you can see, switching can occur mid-stream, allowing envelopes or mailing labels on one printer and letterhead on another. Or invoices on one, and envelopes on another. Or.....**

# **PART IV**

# **Reference Section**

## **Notes:**

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# Appendix A

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## All about cables

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Choosing the proper cables to connect each device to **The Logical Connection** is often the most difficult part of the process. Alas, as with practically everything else in this manual, finding the correct cables is *much* easier if your computers are IBM-PC compatible: since it is so widely standardized, every peripheral manufacturer makes sure its devices will plug into a PC.

What plugs into a PC will plug into **The Logical Connection** with the same cable.

If your cable requirements are *not* so simple, this appendix contains more technical information to help you make the proper selection. It also lists sources and part numbers for many frequently used cables.

For the sake of completeness, we will begin by repeating the "simple" rules for finding the right cable.

## The simple rules

### Serial cables

1. To connect a serial printer, plotter or other peripheral to **The Logical Connection**, use the same cable you would use to connect the same device to an IBM-PC. If your devices are presently connected to a PC or compatible, all you have to do is unplug them from the computer and plug them into **The Logical Connection**.
2. To connect an IBM-PC compatible or another computer whose serial ports are set up the same way, use the special red **PC Serial Cable** that came with this package. You may order additional

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cables from Fifth Generation Systems. ("The same way" is a "DTE" RS-232 port with a male DB-25 connector. These terms will be explained in detail below.)

3. To connect a computer whose serial ports are set up the *other* way "DCE" to **The Logical Connection**, use a straight-through RS-232 cable with a female DB-25 connector on **The Logical Connection**'s end, and the appropriate connector for your computer's serial port at the other end.

## Parallel cables

1. To connect a parallel printer to **The Logical Connection**, use a cable designed to connect it to the IBM-PC. The **PARALLEL OUT** ports are set up exactly like the printer ports (LPT1 or LPT2) on an IBM-PC.
2. To connect an IBM-PC or compatible's printer port (LPT1 or LPT2) to **The Logical Connection**, use a straight-through cable with a female DB-25 connector at one end and a male DB-25 connector at the other. If you have another kind of computer, get an *adapter* to convert the port to IBM standard. (Sources for such a cable and adapter are listed at the end of this appendix.)

## Serial interfacing

Finding the right cable is so confusing sometimes because there are so many different ways of "interfacing" (making connections that transfer data) computers and peripherals, especially for *serial* connections. For small computers, the closest thing to a "standard" is the IBM-PC. That's why we set up **The Logical Connection**'s ports to look like a PC's.

### DCE and DTE

Ports 0-3 are **SERIAL** ports, which transfer data a bit at a time. Serial interfaces generally require a simpler cable than parallel interfaces; the cable may be as simple as 3 wires – transmit, receive, and ground. On the other hand, they may require a very complicated cable if all the optional "handshaking" and status lines must be connected. When the RS-232 serial communications standards were first developed, it was decided to call one wire "transmit" and another wire "receive", regardless of which end of the cable you are looking at. This sounds

simple, but it means that one end of the cable is receiving data on a wire called "transmit," and vice-versa. This is a source of endless confusion and frustration. Serial connectors can be set up as "DCE" (Data Communications Equipment) or as "DTE" (Data Terminal Equipment). This works out fine if you're connecting a terminal to a modem, since you can use a simple cable like this:

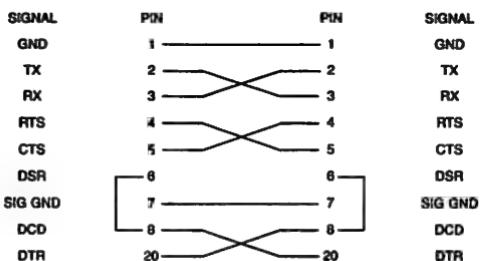
SIGNAL	PIN	PIN	SIGNAL
GND	1	1	GND
TX	2	2	TX
RX	3	3	RX
RTS	4	4	RTS
CTS	5	5	CTS
DSR	6	6	DSR
SIG GND	7	7	SIG GND
DTR	20	20	DTR

The problem is, how do you set up a serial port on a computer? Some companies assume that the ports will be connected to terminals (DTE), so they set up the computer ports to look like modems (DCE). Other companies assume that the ports will be connected to modems (DCE), so they set up the computer ports to look like terminals (DTE). There is NO standard way to set this up.

## Null-modem cables

We elected to set up our ports to look like the serial ports on an IBM-PC (DTE). This means that you can go to your computer store and ask for a cable to connect printer "XYZ" to an IBM-PC, and plug the computer end into the Logical Connection. To connect The Logical Connection to an IBM-PC, you will need a "null-modem" cable (like the red PC Serial Cable supplied with The Logical Connection). A null modem cable swaps the wires so that two devices just alike can communicate (otherwise, each device would try to transmit to the other on the same wire).

The red PC Serial Cable's "pin assignments" are shown below:



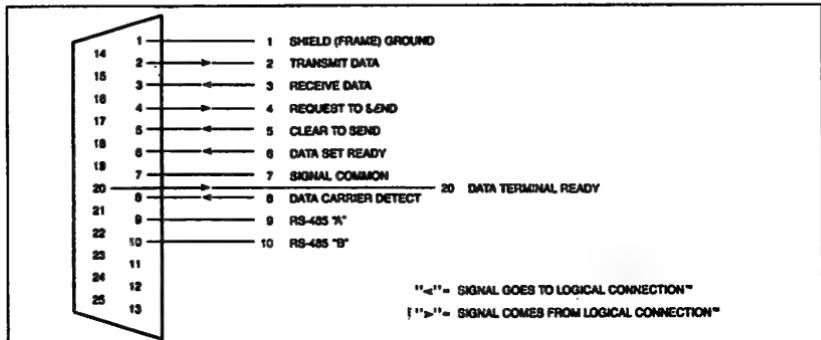
You can create a similar cable by attaching a "null modem adapter" to a straight-through RS-232 cable (however, such a cable might not work for all applications, since a null modem adapter does not typically swap all the "status lines").

## Cable length

The maximum allowable length for a serial interface cable is determined by the baud rate (speed). The lower the baud rate (slower), the longer the cable can be. At 9600 baud, the official limit is about 12 feet. However, many cables up to 300 feet are used every day with no problem. Be optimistic if you wish, but if you are experiencing signal degradation, try shortening the length of the cable or using a slower baud rate.

## Pin assignments

To assist you in locating the proper serial cables, a complete pin diagram of The Logical Connection's serial ports appears below:



## Parallel interfacing

A parallel interface has an individual wire for each “bit” in the “byte” being sent. All the bits are set up at once, side by side (hence the term “parallel”), then another wire in the cable is used to signal that the data is ready. A separate wire is used to signal back that the data has been read (it’s ok to send the next byte).

As you can see, parallel interfaces require lots of wires in the cable. In addition, the cable length is restricted to about 12 feet because of electrical requirements and noise pickup (although many 25 foot cables are being used without problems).

On the bright side, parallel interfaces are more standardized than serial interfaces, so finding the right cable is much easier. If your parallel cable has the right connectors on each end, it’s a pretty safe bet that you have the right cable.

### The centronics interface

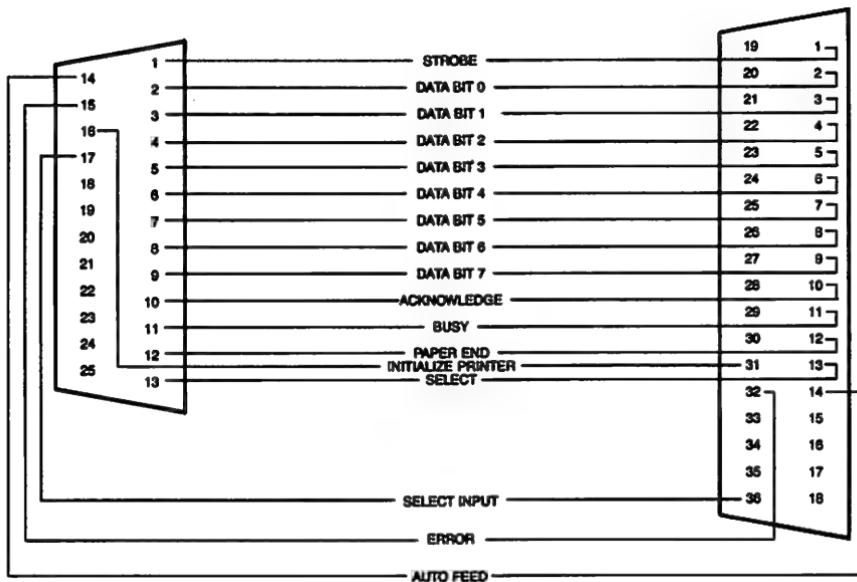
The most common interface for parallel printers is called the “centronics” interface. It uses male and female 36-pin connectors. Most printers that use this interface supply (or make available) a cable for connecting the printer to an IBM-PC. You can use this same cable to connect the printer to **The Logical Connection’s PARALLEL OUT ports**.

If you cannot locate this cable, or prefer to make your own, a 25 conductor cable, with a length of no greater than 10 feet, will meet the standards. The cable must also contain at least 24 gauge wire and a shield. The cable is terminated at **The Logical Connection** with a **male**

**DB-25 connector and at the printer with a 36-pin male centronics connector at the other end. The cable wiring is as follows:**

**DB-25**

**Centronics**



## Pin assignments

To assist you in locating or making the proper parallel cables, pin diagrams of The Logical Connection's PARALLEL OUT and PARALLEL IN ports appear below:

LOGICAL CONNECTION PARALLEL INPUT PORT PIN ASSIGNMENT			
14	1	STROBE (-)	14
2	2	DATA BIT 0 (+)	15
3	3	DATA BIT 1 (+)	16
4	4	DATA BIT 2 (+)	17
5	5	DATA BIT 3 (+)	18
6	6	DATA BIT 4 (+)	19
7	7	DATA BIT 5 (+)	20
8	8	DATA BIT 6 (+)	21
9	9	DATA BIT 7 (+)	22
10	10	ACKNOWLEDGE (-)	23
11	11	BUSY (+)	24
12	12	GROUND	24
13	13	+ 5 VOLTS DC	25
Note: (-) = Active Low (+) = Active High			

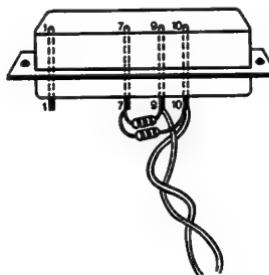
LOGICAL CONNECTION PARALLEL OUTPUT PORT PIN ASSIGNMENT			
14	1	STROBE (-)	14
2	2	DATA BIT 0 (+)	15
3	3	DATA BIT 1 (+)	16
4	4	DATA BIT 2 (+)	17
5	5	DATA BIT 3 (+)	18
6	6	DATA BIT 4 (+)	19
7	7	DATA BIT 5 (+)	19
8	8	DATA BIT 6 (+)	20
9	9	DATA BIT 7 (+)	21
10	10	ACKNOWLEDGE (-)	22
11	11	BUSY (+)	23
12	12	NO CONNECTION	24
13	13	NO CONNECTION	25
Note: (-) = Active Low (+) = Active High			

# Network interfacing

When you connect two or more **Logical Connection** boxes together ("daisy-chaining"), you will need to plug *all* of your boxes together with a special "twisted-pair" cable that is connected to each **Logical Connection**'s SERIAL #0 port.

While it is *possible* to use practically any 2-conductor wire for this purpose, you will get longer distances and much better performance from better-quality cable. For best results we recommend an RS-485 shielded twisted-pair cable with a characteristic impedance of 120 ohms, Belden Type 9841 or equivalent.

You can order this cable, along with properly terminated DB-25 connectors, from **Fifth Generation Systems**. If you prefer to make up your own cable and connectors, use standard **female** DB-25 connectors and attach the two wires to pins 9 and 10. All pin 9's are tied together, all pin 10's are tied together. Attach the cable shielding to pin 1. The cable ends must be terminated with a resistor of the same value as the characteristic impedance of the cable as specified by the manufacturer (do not try to determine the impedance yourself, as it cannot be accurately measured with an ohm meter). Put the resistor *across* the two wires, or "split" the resistance and put one resistor between each wire and the cable shielding as shown in the diagram below. "T" or "spur" connections are not permitted.



NETWORK PIN TERMINATION

If you choose to make up your own *unshielded* cable – or use existing telephone wiring – just connect the two wires to pins 9 and 10 and terminate each end of the cable with the appropriate resistor.

**Remember that unshielded and/or small diameter cable will degrade maximum performance, so experiment first if there are long distances or many boxes to be connected.**

## Sources

In many cases **Fifth Generation Systems** can supply you with the necessary cable to complete your connections. The following cables and connectors are available for immediate shipment:

1. Additional **red PC Serial Cables** (the correct cable to connect a PC's serial (COM1 or COM2) port to **The Logical Connection**).
2. **Straight-through RS-232 cables** (for connecting many non-IBM compatible serial **DCE** devices to **The Logical Connection**).
3. **PC-to-Logical Connection parallel cables**.
4. **Belden Type 9841 shielded twisted-pair cable**, in custom lengths for "**Daisy-Chained**" multi-box configurations.
5. Properly terminated **male DB-25** connectors to use with **twisted-pair cable** in multi-box configurations.

In addition, we may be able to provide other cables or unusual cables for special requirements. If we do not stock the cable you need, we will provide information about suggested manufacturers, part numbers, ordering sources, etc. to make locating the proper cable as simple as possible.

To order cables, or for additional information, call the **TOLL FREE** Technical Support Number listed in **Appendix F** for assistance.



# Appendix B

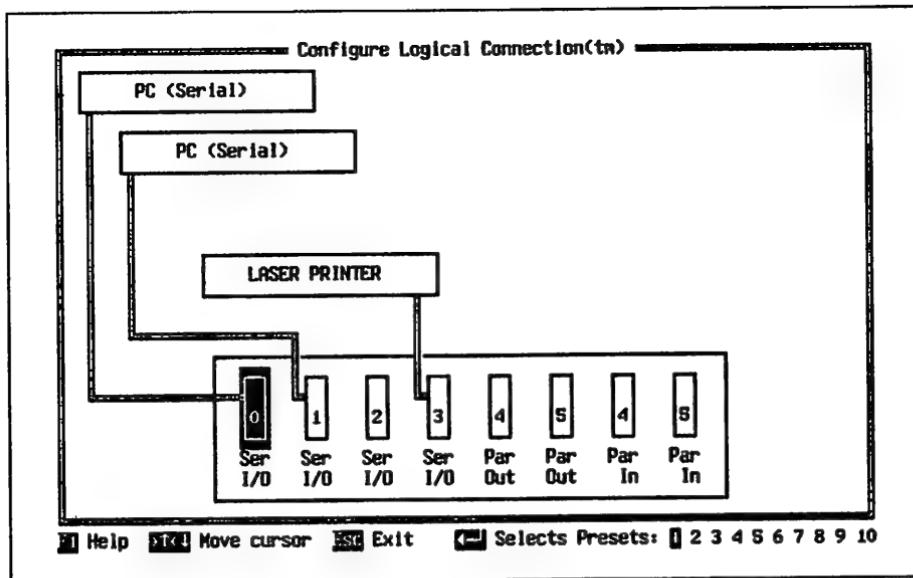
## Preset Configurations

Ten ready-to-use **preset configurations** are supplied on the **Utility Program Disk**. They can be called up quickly with the **LCSETUP** program and downloaded into **The Logical Connection**. If none of them is exactly what you need, they can be modified easily.

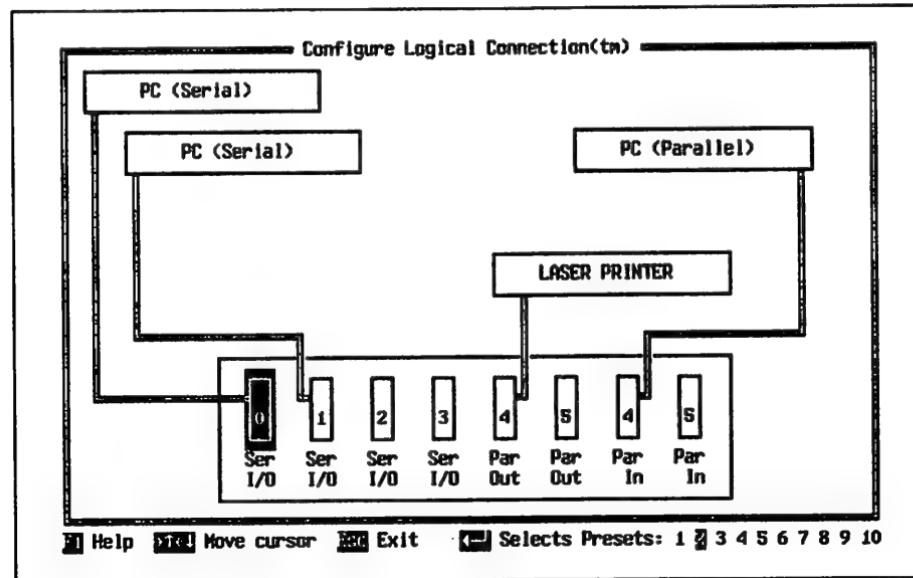
For complete instructions on using **LCSETUP**, please refer to Chapters 4 and 5. You *must* use an IBM-PC or compatible to run the **LCSETUP** program. Non-compatible users may wish to use the diagrams and configuration listings on the following pages as a guide in setting up their own configurations manually.

- Each preset is pictured as it first appears when you choose "Select Preset Configuration" on the **ALT-M** menu of the "Configure Logical Connection" screen.
- All *serial* devices are configured to **Baud Rate: 9600, Parity: None, Word Length: 8** and **Handshaking Protocol: Hardware**. (Of course, any of these settings can be easily changed, using the **LCSETUP** program. See **Chapter 5**).
- All printers and plotters (*serial and parallel*) are configured to **Automatic Form Feed: Yes** and **Time Out: 10**. Other devices have no **Form Feed** or **Time Out** period.
- The connections for all computers are **SWITCHABLE** to all peripheral devices.
- The connections for all peripheral devices are **FIXED** to their own ports.
- All *serial-to-serial* connections are **BIDIRECTIONAL**.

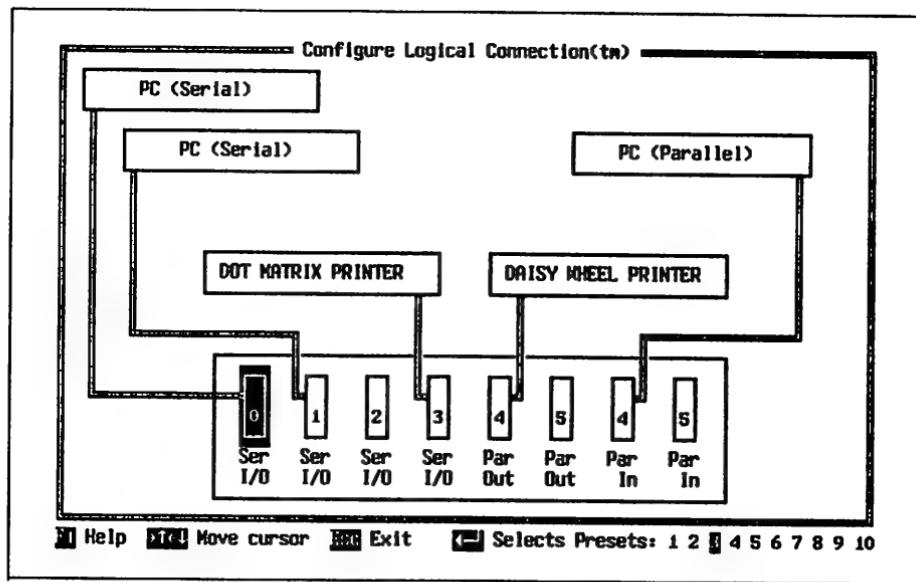
## Preset #1



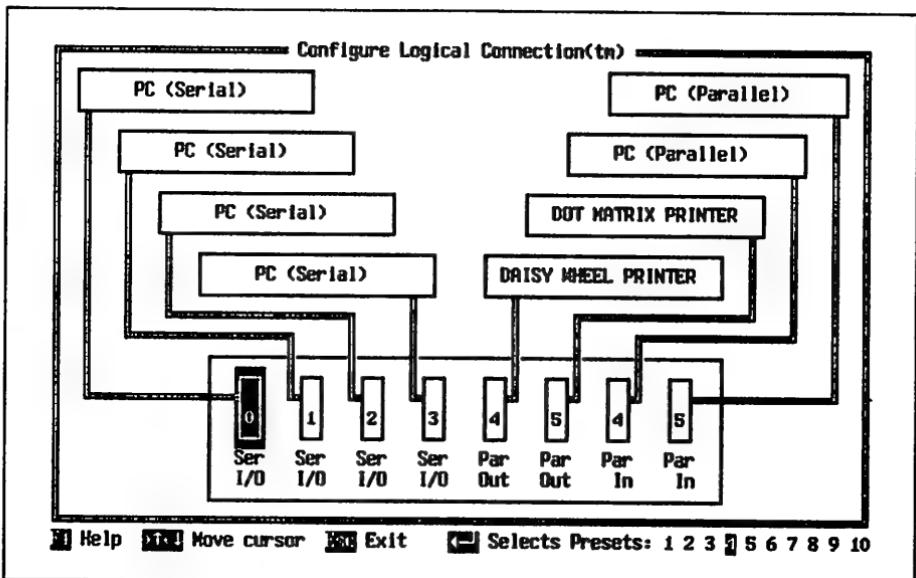
## Preset #2



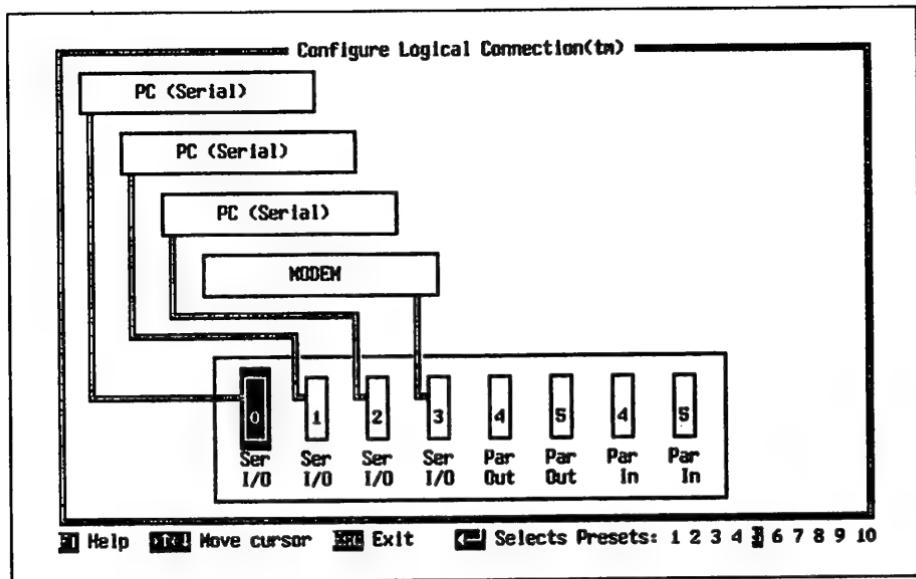
### Preset #3



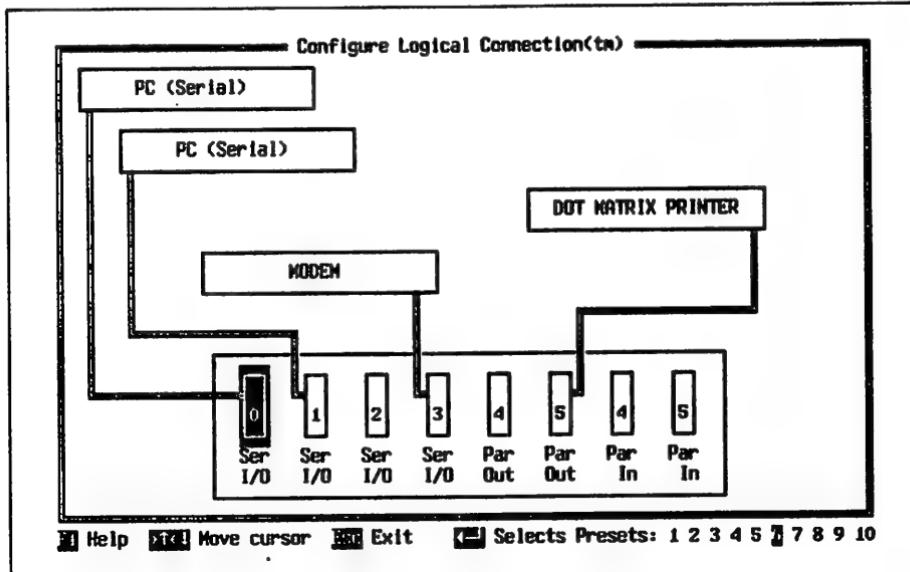
## Preset #4



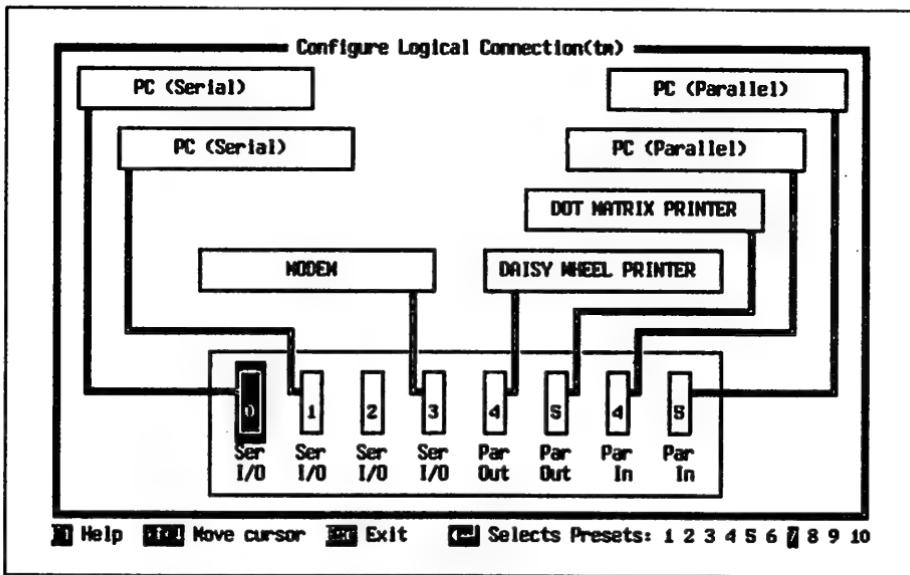
## Preset #5



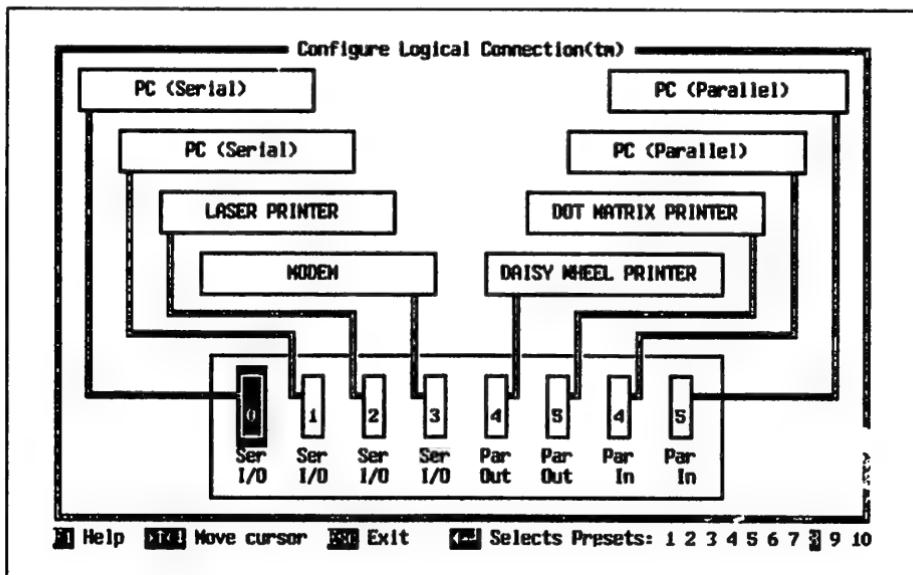
## Preset #6



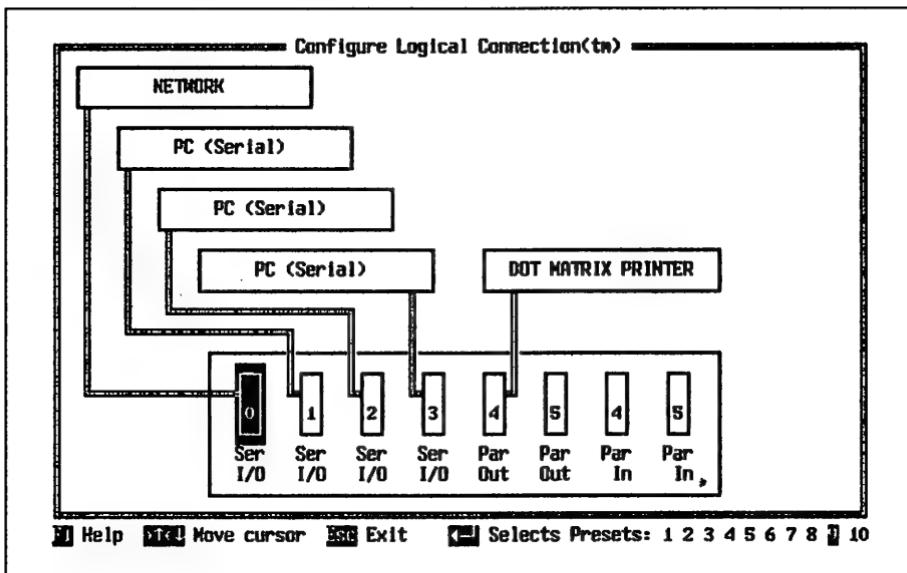
## Preset #7



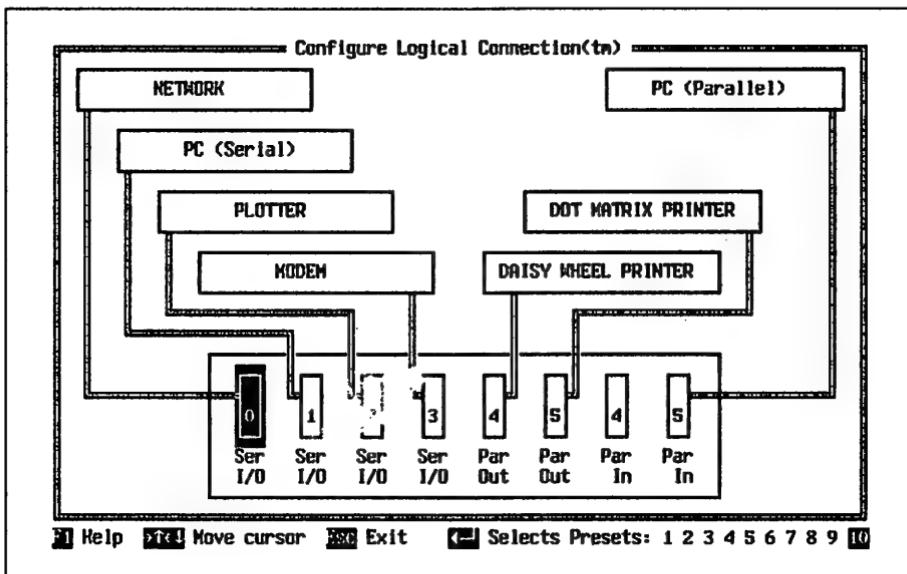
## Preset #8



## Preset #9



## Preset #10



# Appendix C

## RUN and STATUS Indicators

### Summary of conditions

CONDITION	RUN	STATUS
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<b>Initial Startup or RESET</b>		
For first 20 seconds	Flashing	On
Next 4 seconds	Off	Off

<b>Single box operation</b>		
Normal operation	On	Off
Selection string received	On	$\frac{1}{2}$ sec. Flash
Buffer full	Flashing	Does not affect STATUS LED

<b>Network "daisy-chained" mode</b>		
Trying to establish communications	On	Flashes at 2 sec. intervals
Communications established	On	On but flickering rapidly
2 boxes with same number	On	Off
Bidirectional string acknowledged	On	$\frac{1}{2}$ sec. Flash
Buffer full	Flashing	Does not affect STATUS LED



## Appendix D

# Preventing Radio & TV Interference

**Warning:** This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio and television reception. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient the receiving antenna.
2. Relocate the computer with respect to the receiver.
3. Move the computer away from the receiver.
4. Plug the computer into a different outlet so that computer and receiver are on different branch circuits.
5. Ensure that the mounting screws, attachment connector screws and ground wires are tightly secured.
6. Ensure that good quality, shielded and grounded cables are used for data communications.

If necessary, the user should consult the dealer or an experienced

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radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful:

**"How to Identify and Resolve Radio-TV Interference Problems."**

This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-0345-4.

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## Appendix E

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# Troubleshooting The Logical Connection

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### Single box troubleshooting

The Logical Connection is actually a small computer that accepts data and then routes it to an output, as defined in the configuration. It will buffer the data if the output device is busy or off-line. IN troubleshooting the LC it is important to remember that every device-to-device connection through the LC (for example, a PC connected to a printer) requires *two* separate interfaces:

1. the interface between the first device (say, a PC) and the LC, and
2. the interface between the LC and the second device (say, a printer).

This is important in determining if a problem exists on the "input" side of The Logical Connection (in this example, the PC), or the "output" (printer) side .

Listed on the following pages is a set of possible problems with their related possible causes and solutions. If after trying the suggested solutions a problem still exists, call the technical support staff for assistance.

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**The LED's do not come on, and no data will go through the box.**

**Cause:** The AC outlet is not ON or is defective.

**Solution:** Try plugging the LC into a different AC receptacle.

**Cause:** The power transformer is not connected to the LC.

**Solution:** Connect the 3-hole plug (at the end of the transformer cord) into the socket on the LC.

**Cause:** One of the cables connected to the LC is not wired correctly.

**Solution:** With the LC powered ON, disconnect the cables from the LC, one at a time. If the LEDs come ON after disconnecting one of the cables, this is the bad cable. Replace the bad cable or repair the wiring.

**Data will not go to the LC from a computers serial port. The following error message may be displayed:**

**Error Writing Device COM1:  
Abort, Retry, Ignore**

**The machine also locks up when the "PrtSc" (Print Screen) option is attempted.**

**Cause:** The cable connecting the computer to the LC is not plugged into the correct port on the LC.

**Solution:** The cable connecting the computer to the LC must be plugged into one of the serial I/O ports on the LC (#0 - #4). If you are sending the configuration to the LC the computer must be connected to LC port #0.

**Cause:** The cable connecting the computer to the LC is not connected to the correct port on the computer.

**Solution:** Test the computer port with a known working device. Try using a different port on the computer if one is available.

**Cause:** The computer's and the LC's communications parameters (Baud Rate, Data Bits, Parity and Protocol) are not set to the same value.

**Solution:** Change either the PC's or LC's communication parameters so that they are set the same.

**Cause:** The cable connecting the computer to the LC is not wired properly.

**Solution:** Try using a different cable or check the cable's wiring.

**Cause:** The Logical Connection's buffers are full.

**Solution:** Wait for the buffer to empty itself normally, or press the RESET button.

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**Data will not go to the LC from a computer's parallel port. A possible error message displayed:**

**Error Writing Device LPT1:  
Abort, Retry, Ignore**

**The computer also locks up during a PrtSc (Print Screen) operation.**

**Cause:** The cable connecting the computer to the LC is not plugged into the correct port on the LC.

**Solution:** The cable connecting the computer to the LC must be plugged into one of the parallel input ports on the LC (#4 or #5).

**Cause:** The cable connecting the computer to the LC is not connected to the correct port on the computer.

**Solution:** Test the computer port with a known working device. Try using a different port on the computer if one is available.

**Cause:** The cable connecting the computer to the LC is not wired properly.

**Solution:** Try using a different cable or check the cable's wiring.

**Cause:** The Logical Connection's buffers are full.

**Solution:** Wait for the buffer to empty itself normally, or press the **RESET** button.

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## **Data is not sent from the LC's serial output port to a serial device, or data is sent to the wrong output port.**

**Cause:** The switch string that was sent from the computer was not recognized by the LC.

**Solution:** Check to see that the switch string that was sent to the LC contains exactly the same characters as those stored in the LC's configuration. These strings must be the same for the LC to switch to another port. If you are using the POPLC program to send switch strings make sure you are using the correct CONFIG.LC file.

**Cause:** The LC's and serial device's communication parameters (Baud Rate, Data Bits, Parity, and Protocol) are not set to the same values.

**Solution:** Either change the serial device's communication parameters or change the LC's so that they contain the same values. If you change the parameters on the LC using the LCSETUP program, remember to send the new configuration to the LC.

**Cause:** The output device is offline, turned off or not working.

**Solution:** Try testing the device by sending data directly from the computer. If it fails repair or replace the device.

**Cause:** The cable connecting the LC to the serial device is not wired properly.

**Solution:** Try using a different cable or check the cable's wiring.

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**Data is not sent from the LC's parallel output port to a parallel device, or data is sent to the wrong output port of the LC.**

**Cause:** The switch string that was sent from the computer was not recognized by the LC.

**Solution:** Check to see that the switch that was sent to the LC contains exactly the same characters as those stored in the LC's configuration. These strings must be the same for the LC to switch to a another port. If using the POPLC program to send switch strings be sure you are using the correct CONFIG.LC file.

**Cause:** The output device is offline, turned off or not working.

**Solution:** Try testing the device by sending data directly from the computer. If it fails repair or replace the device.

**Cause:** The cable connecting the LC to the serial device is not wired properly.

**Solution:** Try using a different cable or check the cable's wiring.

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## **Bidirectional communication does not work.**

**Cause:** The bidirectional string sent from the computer was not recognized by the LC.

**Solution:** Check to see that the bidirectional string sent from the LC contains exactly the same characters as those stored in the LC's configuration. These strings must be the same for the LC to switch to another port. If using The POPLC program to send switch strings, be sure you are using the correct CONFIG.LC file.

**Cause:** The switch string sent from the computer was not recognized by the LC.

**Solution:** Check to see that the switch string sent to the LC contains exactly the same characters as those stored in the LC's configuration. These strings must be the same for the LC to switch to a another port. If using the POPLC program to send switch strings, be sure you are using the correct CONFIG.LC file.

## Multiple box troubleshooting

In trouble-shooting a multiple **Logical Connection** network we have three separate interfaces to consider: the interface between the device and the LC, the interface between the LC and an output device and the *network* interface that connects the LC's together. This idea is important in determining where a problem exists.

---

## **The LED indicators do not come on and no data is output on the receiving LC.**

**Cause:** The AC outlet is not ON or is defective.

**Solution:** Try plugging the LC into a different AC receptacle.

**Cause:** The power transformer is not connected to the LC.

**Solution:** Connect the 3-hole plug (at the end of the transformer cord) into the socket on the LC.

**Cause:** One of the cables connected to the LC is not wired correctly.

**Solution:** With the LC powered ON, disconnect the cables from the LC, one at a time. If the LEDs come ON after disconnecting one of the cables, this is the bad cable. Replace the bad cable or repair the wiring.

---

**Data will not go to the LC from the computer's serial port.**  
**An error message may be displayed:**

**Error Writing Device COM1:  
Abort, Retry, Ignore**

**The machine also locks up when the "PrtSc" (Print Screen) option is attempted.**

**Cause:** The cable connecting the computer to the LC is not plugged into the correct port on the LC.

**Solution:** The cable connecting the computer to the LC must be plugged into one of the serial I/O ports on the LC (#0 - #4). If you are sending the configuration to the LC the computer must be connected to LC port #0.

**Cause:** The cable connecting the computer to the LC is not connected to the correct port on the computer.

**Solution:** Test the computer port with a known working device. Try using a different port on the computer if one is available.

**Cause:** The computer's and LC's communication parameters (Baud Rate, Data Bits, Parity and Protocol) are not set to the same values.

**Solution:** Change either the computers or the LC's communication parameters so that they are set the same.

**Cause:** The cable connecting the computer to the LC is not wired properly.

**Solution:** Try using a different cable or check the cable's wiring.

**Cause:** The Logical Connection's buffers are full.

**Solution:** Wait for the buffer to empty itself normally, or press the **RESET** button.

---

---

**Data will not go to the LC from a computer's parallel port.  
An error message may be displayed:**

**Error Writing Device LPT1:  
Abort, Retry, Ignore**

**The computer also locks up during a PrtSc (Print Screen) operation.**

**Cause:** The cable connecting the computer to the LC is not plugged into the correct port on the LC.

**Solution:** The cable connecting the computer to the LC must be plugged into one of the parallel input ports on the LC (#4 or #5).

**Cause:** The cable connecting the computer to the LC is not connected to the correct port on the computer.

**Solution:** Test the computer port with a known working device. Try using a different port on the computer if one is available.

**Cause:** The cable connecting the computer to the LC is not wired properly.

**Solution:** Try using a different cable or check the cable's wiring.

**Cause:** The Logical Connection's buffers are full.

**Solution:** Wait for the buffer to empty itself normally, or press the **RESET** button.

---

## **Data is not sent across a network through an LC's serial output port to a serial device.**

**Cause:** The switch string that was sent to the sending LC was not recognized by the sending LC.

**Solution:** Check to see that the switch string that was sent to the LC contains exactly the same characters as those stored in the LC's configuration. These strings must be the same for the LC to switch to another port. If using the POPLC program the send switch strings be sure you are using the correct CONFIG.LC file.

**Cause:** The receiving LC's and serial device's communication parameters (Baud Rate, Data Bits, Parity and Protocol) are not set to the same values.

**Solution:** Either change the serial device's communication parameters or change the LC's so that they contain the same values. If you change the parameters on the LC using the LCSETUP program, remember to send the new configuration to the LC.

**Cause:** One of the cables connected to the LC is not wired correctly.

**Solution:** With the LC powered ON, disconnect the cables from the LC, one at a time. If the LEDs come ON after disconnecting one of the cables, this is the bad cable. Replace the bad cable or repair the wiring.

**Cause:** Two of the boxes on the network have the same box number.

**Solution:** Refer to Appendix C, "RUN and STATUS Indicators," for information on detecting two boxes with the same number. Once the duplicate box is found, change the box number and reconfigure that box.

**Cause:** The output device is offline, turned off or not working.

**Solution:** Try testing the device by sending data directly from the computer. If it fails repair or replace the device.

**Cause:** The cable connecting the receiving LC's serial device is not wired properly.

**Solution:** Try using a different cable or check the cable's wiring.

---

---

## **Data is not sent across a network through an LC's parallel output port to a parallel device.**

**Cause:** The switch string that was sent from the computer was not recognized by the LC.

**Solution:** Check to see that the switch that was sent to the LC contains exactly the same characters as those stored in the LC's configuration. These strings must be the same for the LC to switch to a another port. If using the POPLC program to send switch strings be sure you are using the correct CONFIG.LC file.

**Cause:** The output device is offline, turned off or not working.

**Solution:** Try testing the device by sending data directly from the computer. If it fails repair or replace the device.

**Cause:** The cable connecting the LC to the serial device is not wired properly.

**Solution:** Try using a different cable or check the cable's wiring.

---

## **Bidirectional communication does not work.**

**Cause:** The bidirectional string sent from the computer was not recognized by the LC.

**Solution:** Check to see that the bidirectional string sent from the LC contains exactly the same characters as those stored in the LC's configuration. These strings must be the same for the LC to switch to another port. If using The POPLC program to send switch strings, be sure you are using the correct CONFIG.LC file.

**Cause:** The switch string sent from the computer was not recognized by the LC.

**Solution:** Check to see that the switch string sent to the LC contains exactly the same characters as those stored in the LC's configuration. These strings must be the same for the LC to switch to a another port. If using the POPLC program to send switch strings, be sure you are using the correct CONFIG.LC file.

## Appendix F

# Technical Support

Fifth Generation Systems provides TOLL FREE technical support for users. In order to assure prompt service, please fill out and mail your **Warranty Registration Card** immediately.

If you should experience any problems with The Logical Connection – cabling, setup or other difficulties – our technical support staff is available to assist you from 8:30 to 5:30 (Central Standard Time) Monday through Friday at:

(504) 291-7283

In addition, you may order additional PC Serial Cables (like the red one that came with your **Logical Connection**), shielded *twisted-pair* cable, resistor-terminated connectors and many other special cables and supplies by calling the technical support number.

You may also contact Technical Support to arrange for upgrading your 256K model **Logical Connection** to the 512K model. The cost is \$100.

In the event that your **Logical Connection** should require servicing, upgrading or replacement, you *must* obtain a Return Merchandise Authorization (RMA) number from your technical support representative, who will explain the return procedure in detail. **Shipments received without this number prominently displayed on the package will be returned unopened at the sender's expense.**



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## Appendix G

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# Warranty Information

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### **Limited Warranty for**

### **The Logical Connection**

Fifth Generation Systems, Inc. hereby warrants that it will repair or replace, at its option, any part of **The Logical Connection** with which this warranty is enclosed which proves defective by reason of improper workmanship and/or material, without charge for parts or labor, for a period of 180 days from the date of original retail purchase. This warranty only applies if such original purchase by the buyer was made in the United States of America.

This warranty applies only if your **Logical Connection** fails to function properly under normal use and within the manufacturer's specifications. This warranty does not apply if Fifth Generation Systems, Inc.'s logo or serial number has been removed or defaced, or if your **Logical Connection** has been damaged by accident, abuse, misuse or misapplication. This warranty is automatically voided if your **Logical Connection** is modified or serviced by other than Fifth Generation Systems, Inc. or an authorized Fifth Generation Systems, Inc. Service Center.

**THE DURATION OF ANY IMPLIED WARRANTY OF  
MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE,  
OR OTHERWISE ON YOUR LOGICAL CONNECTION SHALL BE  
LIMITED TO THE DURATION OF THE EXPRESS WARRANTY SET  
FORTH ABOVE. IN NO EVENT SHALL FIFTH GENERATION  
SYSTEMS, INC. BE LIABLE FOR ANY LOSS, INCONVENIENCE  
OR DAMAGE, WHETHER DIRECT, INCIDENTAL,  
CONSEQUENTIAL OR OTHERWISE, OR WHETHER CAUSED BY  
NEGLIGENCE OR OTHER FAULT RESULTING FROM BREACH**

---

**OF ANY EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OTHERWISE, WITH RESPECT TO YOUR LOGICAL CONNECTION EXCEPT AS SET FORTH HEREIN.** Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

A copy of the Dealer's bill of sale or other satisfactory proof of the date of the original buyer purchase of your **Logical Connection** must be made available to obtain service under this warranty.

If you discover a defect, Fifth Generation Systems, Inc. will, at its option, repair or replace **The Logical Connection** at no charge to you provided you return it during the warranty period. You must obtain a Return Merchandise Authorization (RMA) number from your technical support representative, who will explain the return procedure in detail. *Do not return your Logical Connection to Fifth Generation Systems, Inc. until you have received authorization to do so.*

You may request information on how to obtain service under this warranty by contacting:

**Fifth Generation Systems, Inc.**  
Technical Support  
(504) 291-7283

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# Appendix H

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## Glossary

---

**BAUD RATE**

The speed of serial data transfer is expressed in "baud." Baud is roughly equivalent to bits per second. The important thing about setting the baud rate is simply that the devices at both ends of the cable must be set the **SAME**, otherwise they will not be able to communicate with one another. You may set **The Logical Connection** to operate at standard increments from 300 to 9600 baud.

**BIDIRECTIONAL CONNECTION**

A serial communication link in which data is transmitted and received in both directions; that is, a two-way "conversation." To ensure that a switched connection is fully bidirectional, a special selection string may be entered which will "capture" the output of the device to which you have switched. To use this feature, send *both* the **BIDIRECTIONAL** string *and* the regular selection string for the device you want to connect with.

**BUFFER**

A block of computer memory which stands between an incoming data stream and an outgoing data stream. By accepting and storing data which comes in faster than it can go out, a buffer frees the input device from having to wait until the output device is ready. In **The Logical Connection**, a special selection string is defined which allows you to clear the buffers (erase what is stored in them) for each channel.

---

**DAISY- CHAINING**

When several **Logical Connection** boxes are hooked together with a single twisted-pair wire, they are said to be "daisy-chained" together. Up to 45 separate **Logical Connection** boxes can be linked in this way, giving every device on every box potential access to any other device on the whole chain.

**DCE**

"Data Communications Equipment". This is the standard serial configuration for modems.

**DTE**

"Data Terminal Equipment". This is the standard serial configuration for terminals, teletypes, etc.

**FORM FEED**

You will be asked (in the Configuration Menu) if you want **The Logical Connection** to supply an automatic form-feed when the time out expires. This is simply a control character that advances the paper to the beginning of a new page. It will keep the printed output from different computers separated, and ensure that each document begins on a fresh sheet of paper.

**LEAD-IN CHARACTER**

The special character used to begin each *selection string* (see below). You must choose a lead-in character each time you define a port as *switchable* on the Configuration Menu; and each selection string for that port must begin with the same character. You should pick a character which is not frequently used in your data files (like ~ or ^) since **The Logical Connection** will slow down to check each occurrence of the lead-in character to see if it begins a valid selection string.

**NULL MODEM**

A special cable (or adapter) that swaps the transmit and receive lines so that a "DCE" or "DTE" serial port can connect directly to another port of the same type (normally, a "DCE" port must be connected to a "DTE" port). A "complete" null modem cable/adapter will also swap the sending and receiving "status lines."

---

**PARITY**

To help detect transmission errors, an extra bit can be sent which is the "parity" bit. "EVEN PARITY" means that the sum of 1's in the data word *plus* the parity bit is always *even* (in other words, the parity bit is set if there are an odd number of 1's in the data word). "ODD PARITY" means that the parity bit is set if there are an *even* number of 1's in the data word (thus the *total* number of 1's is always *odd*. "NO PARITY" means that the bit is not used.

**PROTOCOL**

Serial devices use one of several schemes to tell the sending device when the receiving device can no longer accept data. **The Logical Connection** supports the most commonly used schemes:

1. A separate wire is used as a signal to tell the sender to stop sending. This is known as "hardware handshaking."
2. A special code is sent from the receiving device to the sending device to request that data transmission be suspended. Normally, this code is an "XOFF" (control-S). When transmission can resume, another code is sent. Normally, this code is an "XON" (control-Q). Most large computers support this scheme on their CRT channels.

**The Logical Connection** must use flow control because it is not always guaranteed that the receiving device can immediately accept the data. If you are unsure of which scheme your device uses choose "both," (*unless* you are transmitting *binary* data, in which case you should always choose "hardware" protocol).

**SELECTION STRING**

A term used to identify the "switch code" that tells **The Logical Connection** to switch connections from one device to another. It is composed of a special infrequently used lead-in character, followed by any eight characters. All eight characters must be used

(no spaces), and it must be entered exactly (including upper & lower case differences) to effectively switch to another connection.

#### **STAT MUX**

Short term for "Statistical Multiplexer," a communications device which divides a single data channel into several separate channels. While The Logical Connection does not work on the same electronic principle as a Stat Mux, it can accomplish the same purpose in allowing several separate connections to be made over a single telephone line at the same time.

#### **TIME OUT**

Devices plugged into The Logical Connection may be *shared* by many other devices. For example, a single printer may be shared by many computers. In order to manage this sharing when there are competing data streams, you will be asked to define a TIME OUT period in seconds. The Logical Connection will use this time out period to decide how long to wait after it has finished receiving data from one computer, before turning this device over to another computer.

#### **WORD LENGTH**

Data is transferred in "bytes." A byte is usually 8 bits, but may be 6 or 7. The serial interface breaks up each byte into bits and sends them one at the time, like an old-style telegraph. The number of bits per byte (in this case, byte is synonymous with word) equals the word length.

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**Fifth Generation**  
SYSTEMS, INC.



# The Logical Connection<sup>TM</sup>

Instruction Manual



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